SPLENDID PERFORMANCE OF THE "WM. PENN"

NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Vessels

"MOTORSHIP" is entered as second-class matter at the Post-office at New York, N. Y., U. S. A., July, 1918, under the Act of March 3rd, 1879. Office of Publication, 282 W. 25th St., New York, N. Y.

Issued Monthly
PRICE 25 CENTS
Domestic, $3.00 per year
Foreign, $3.50 per year

MAY, 1922
Vol. 7 No. 5

EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

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PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

Vol. VII | New York, U. S. A., May, 1922 | No. 5

(Cable Address—Freemote, New York)

Establishing the Supremacy of the Motorship

Complete Details of the Round-the-World Voyage of the "William Penn," Together with Comparisons with Sister Steamships That Have Made Similar Trips—A Performance Unequaled by Any American Steamer

(Specially Written for MOTORSHIP)

SUFFICIENT convincing evidence should emanate from the records of the six-months maiden voyage around the World of the U. S. Shipping Board's twin-screw 12,375 tons deadweight motorship *William Penn* to cause every far-sighted shipowner to either build new Diesel-driven craft or to convert his existing steam-vessels to motor power. Her performance leaves nothing to doubt. On the 19th of March she completed a tramp cruise of 28,567 nautical-miles, thoroughly demonstrating the reliability of this type of power and establishing the great economic superiority of the motor-vessel over any class of steam-driven ship. Incidently she is said to have made a profit for her operators of about $180,000 on the outward trip and covered a little more than expenses on the homeward voyage. This means something during this period of ocean-freight depression.

Her performance was satisfactory in every way, and this operation was not the result of special "stage-setting." In fact it can and will be duplicated many times by this ship, and has been duplicated by numerous other motor-vessels during the past ten years owned by foreign interests. However, it never can be equalled by any steamer afloat whether European or American. But this record of her initial voyage around this planet is of very great importance because she is the first American Diesel-driven ship of her size to complete this circuit; and, as she is operated by a responsible domestic company her recorded performance stands indisputable. Also it is a lesson to shipowners and to the Board of the grave error made during the few years following the Armistice in neglecting to take full advantages of the vast all-around economies available to them in the internal-combustion engine.

Foreign motorships have for many years voyaged around the world, and their records of economy have frequently appeared in our pages. Unfortunately such records have too often been regarded with a sceptical pinch of salt, and considered as garnished with flowers by a publication biassed in their favor. True as our data has been, many shipowners as well as Shipping Board officials have seemed to feel that they must see for themselves—like Thomas of biblical fame—these figures duplicated by an American motorship operated by an American crew under the American flag and under the very worst of shipping conditions. Now such conditions have been met and the figures available to all, none need wait longer to determine the advisability of Diesel power for every suitable ship.

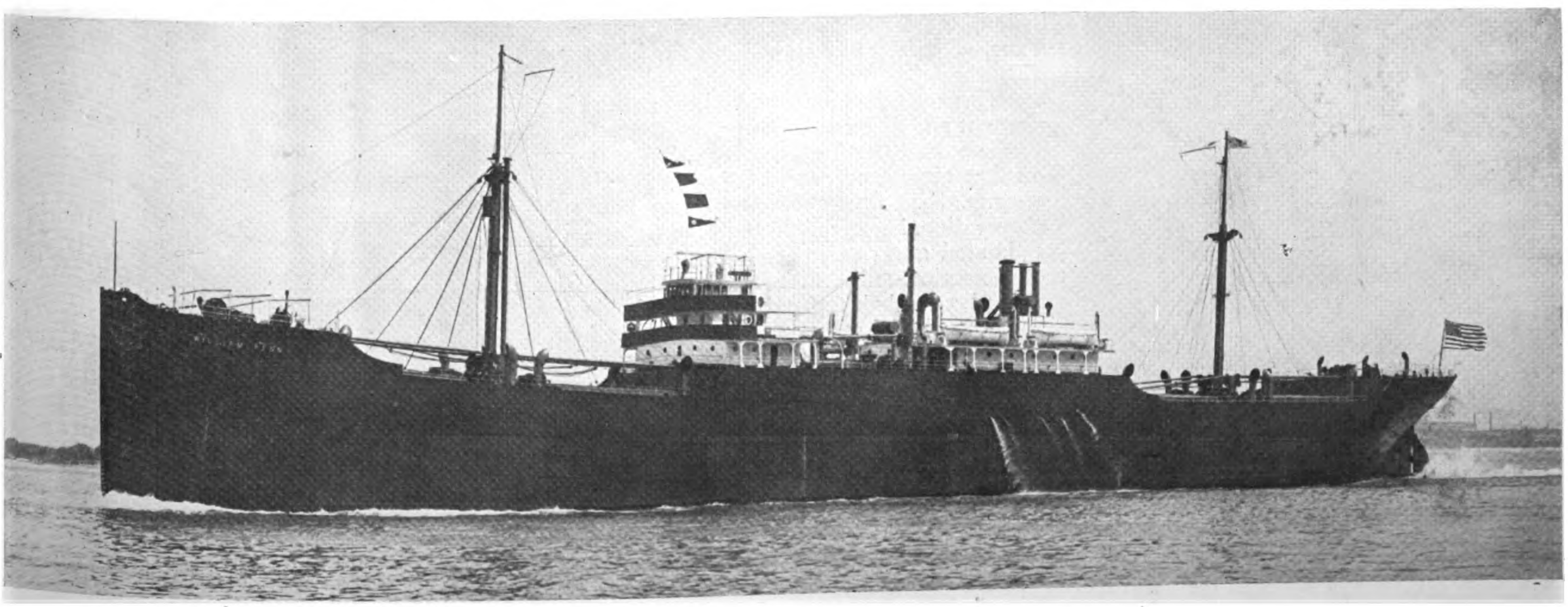
ANOTHER TRIUMPH FOR THE DIESEL ENGINE

By this voyage the Shipping Board's only motorship has convincingly established the superiority of the Diesel drive. She averaged over 10½ knots for 28,567 nautical-miles on a daily fuel-consumption of 13 tons, and netted nearly $200,000 for her operators. This with a total repair bill in six months of $70. On the last day of her trip she averaged 12.8 knots. For eighteen days non-stop run she averaged 11.48 knots.

All the figures which appear in this article have been carefully checked, and the ship's log-book has been exhaustively studied for the purpose. We understand that the Shipping Board also is preparing some comparison data, and when the same is released for publication it will be most interesting to compare the same with our figures. As a matter of fact the comparisons of fuel and lubricating-oil costs which we give were courteously furnished to us by Admiral Benson.

There has been much talk about motorships not being economical because they cost from ten to fifteen per cent more than steamers to construct complete with machinery, due to the cost of Diesel-engines being about thirty per cent. higher than steam-engines and boilers and that the *William Penn* was too expensive. We maintain that such arguments are distinctly inaccurate and unfair! The error is due to many having taken two hulls of the same dimensions one with steam and the other with Diesel power, and making comparisons accordingly. As the two types of vessels are fundamentally different such comparisons can only be misleading. We will explain why!

To enable a steamer of the same dimensions to average the same round-world speed as the *William Penn* it would be necessary to equip her with higher powered machinery—say about 750 i.p.h. greater, which would increase her first cost, overhead and operating charges, etc., and possibly make one more fireman necessary, as well as weigh more and occupy more space and increase the fuel-consumption to a total of about 45 tons a day, compared with the 13 tons of this motorship. Also the bunker space would have to be increased, thus making another reduction in the net-cargo



The "William Penn"

capacity by both weight and volume. *However, to carry the same quantity of net-cargo the same distance as this motorship a steamer would have to be nearly a thousand tons larger;* consequently she would be just as expensive to construct, especially as this additional tonnage means more power again and extra fuel-consumption up to a total of about 50 tons of fuel-oil per day.

What a shipowner must do to get a true comparison is to plan a steamer to carry 627,830 cubic feet of bulk-cargo underdeck or 11,500 tons of weight-cargo *as well as sufficient fuel* for a distance of 20,000 to 30,000 miles at an average sea-speed through storm and calm of 10¾ to 11½ knots without re-bunkering. Then compare her dimensions, power, crew and cost at to-day's prices and operating charges with those of the *William Penn.* If first cost is to be taken into consideration a motorship should always be compared with a steamer of 7% to 10% greater dimensions to obtain a fair comparison. Presently we will compare her with a turbine-electric driven steamer of slightly smaller dimensions which made a similar voyage operated by the same company, because we have no data on a larger vessel than the "William Penn." It is true that the comparison will to an extent be misleading so far as the overhead charges are concerned, as the result should be more in favor of Diesel propulsion than are shown by this comparison. The shipowner must get away from the habit of thinking in deadweight tons. The motorship has made this tonnage term obsolete.

One reason for this is that the *William Penn* was a very expensive ship, due to her Diesels having been purchased abroad at the height of the war at top prices, shipped over, and left on the dock for about two years during which time the market prices fell. The hull was designed and started as a steamer and afterwards changed to take the motor power. A considerable number of structural changes and additions had to be made to the hull after her delivery from her builders to Cramps, including many hundreds of new rivets. Consequently, over half her cost should be wiped-off. But all of these things cost unnecessary money. Similar ships can be built today for less than half her cost.

Capt. R. H. Wright, who navigated the "William Penn" around the world. He is enthusiastic over the performance of his ship, but is shy on publicity

"William Penn" loading for her second voyage at the Barber Pier, Brooklyn

She was partly loaded for the outward trip at the Barber Line's Brooklyn pier with general cargo, as well as at the Tidewater Oil Co's. wharf at Bayonne, N. J. When she left New York harbor on Sept. 3, 1921 she had 4,744 tons of cargo aboard, consisting of miscellaneous freight, 129,374 cases of oil and 500 barrels of grease for delivery in the Phillipines and Java. As her double-bottoms and fuel-tanks in the shaft alleys hold enough fuel for a trip round the world, her deep-tank was loaded with paying cargo which in a steamer making such a long trip would have had to be filled with oil. In fact she only burned 1,475 tons of oil for the entire voyage. Prior to her trials on the Delaware she took aboard a quantity of 30° Baumé Diesel-oil supplied by the Atlantic Refining Co. of Philadelphia, at $14.11 per ton or 4.8 cents per gallon. Some of this oil was used on the trials, etc. When in New York she bunkered 300 tons of additional fuel-oil of 29.4° Baumé at 4 cents per gallon, or $1.68 per barrel (7 barrels=1 ton). Thus, when she left New York she had 1,160 tons aboard. We presume she did not take more because she bunkered by barge at the last moment and could not spare more time.

She passed the Ambrose light-ship at 9 p.m. on that night, and reached Savannah, Ga., at 10 a.m. Sept 6th, averaging 10.84 knots by observation, her speed through the water being estimated at 11.44 knots. The distance was 668 nautical-miles. At this port she took aboard 3,350 bales of cotton in her holds and 1,450 barrels of resin on deck. It was found that her daily fuel-consumption figured at 12.23 tons. No attempt to make better speed because the Captain desired to go up the river on the noon tide.

For an eight-hour period on Monday, Sept. 5th, the following data was obtained: R.P.M. 106; I.H.P. (metric) 3,700; I.H.P. (English) 3,650; Oil-consumption per I.H.P. hour (English) 0.315 lb. due to reduced power.

The fuel used on this run was so-called Diesel-oil (solar-oil) and had the following characteristics:

Specific Gravity	0.879 at 60° F
Corresponding to	29.4° Baumé
Flash (open cup)	205° F
Fire	226° F
Viscosity (Saybolt) at 100° F.	42
Sulphur per cent	0.756
Calorific Value	19,450 B.T.U.

Upon leaving Savannah her mean draft was 26 ft. 5 in. She proceeded to Panama, a run of 1,552 nautical-miles, covering the same in 5d 14h 2m. On one day en route she averaged a speed of 11.8 knots on 14 tons of fuel. At Balboa fuel-oil at low price was available, so she bunkered 193 tons (1,351 bbls.) of 24.4 degrees Baumé.

From Panama the course of the *William Penn* lay to Honolulu, 4,711 miles away, which she made after a good run of 17d 19h 34m. At this port the last supply of fuel was taken aboard, this being 216 tons (1,513 bbls.) of 27.2 Baumé oil at $3.15 per bbl., supplied by the Union Oil Co. of Cal., making a grand total of 1,609 tons of fuel bunkered. Of this quantity she burned 1,475 tons in the round trip from New York to New York, including all harbor consumptions, so had ample left when she docked over six months later. From this it is easy to understand the great advantage of the big cruising radius of a motorship, which enables her to buy fuel where the price and quality are the most favorable. Also it reveals the fallacy of the statements made by Sir Owen Phillips and referred to on the Editorial page of this issue of MOTORSHIP. This radius factor alone should place about $10,000 to the credit side of a motor-vessel when comparing her operation cost with that of a steamer engaged on world trading. The average speed maintained over the distance between New York and Manila was 10.9 knots, and from there to New York 10.6 knots. From New York to London via the two canals her average speed loaded was 11.01 knots. Owing to the very heavy storms

Chief-engineer Oscar Olson looks "worried" after his 28,000 mile non-repair trip. Before going to sea on the "William Penn" he was a steamship engineer, this being his first motor-vessel

in the Atlantic the speed from Liverpool to New York almost in ballast was only 8.9 knots, otherwise her average round the world would have averaged much better than 10.6 knots.

On the run from Honolulu to Yokohama the Pacific Ocean gave our "heroine" an exhibition of a gale following a China Sea typhoon and very heavy weather generally. The hull of the *William Penn* is of a very box type with plenty of beam so pounds heavily when coming down after being lifted by a big sea. Thus to save the deck cargo, Captain R. H. Wright hove her to for five hours and then just barely maintained steerage way for another ten hours. Chief Engineer Oscar Olsen advised us that at no time during the voyage did the propellers race. Never has he found a more quick-acting pair of governors, which responded instantly to the slightest increase of engine speed and cut-out the fuel on all cylinders but number six, so that the engines would just turn over while the propellers were out of the water. Such a condition is impossible with reciprocating steam machinery and the vibration of a racing propeller fairly shakes a ship. Furthermore instantly Diesel-driven propellers re-enter the water they regain their normal speed. This factor assists a motorship to average a higher speed over a long period than a steamer. Also in calm weather the propeller-speed is constant within two or three revolutions hour after hour, day after day and week after week, never altering with a change of watch. Aspinall-type governors are fitted, slightly modified by the builders of the engines.

Chief-Engineer Olsen, who has never before been to sea with Diesel engines, also told us that at no time on the voyage did he ever have the slightest anxiety as to the engines being able to more than put the ship through anything that might be met. The engine-room crew of the *William Penn* consists of 14 men, viz., chief-engineer, three assistant-engineers, two electricians, four senior and four junior motor-men, the former drawing oilers' and the latter drawing wipers' pay. An oil-burning steamer of 3,500 horse-power carries an engine crew of at least 19 men and a coal-burning steamer of this power would carry at least 22 men. On her second trip three steam engineers inexperienced with Diesels have been taken on, replacing three men who have gone to other vessels.

In addition to her regular crew the *William Penn* on her maiden voyage carried a guarantee-engineer, Mr. Oscar Mattesen, representing Wm. Cramp & Sons Ship and Engine Bldg. Co., who now goes with the *Californian*. Chief-Engineer Olson told us that after being shipmates with steam-engines and then running Diesel-engines he would not want to go back

Air-signals of the "William Penn"; the upper horn is of American manufacture, the lower of foreign make

to the steam-engine, feeling that the Diesel engines handle more easily and quicker and are in every way superior to the steam plant, apart from the economy. On this run to Japan, and on the run from Liverpool to the end of the voyage at New York the machinery received a thorough test, driving the ship against a very strong wind and seas in each case. Only once did either main engine have to be stopped at sea, and this was for a very short time to adjust a telescopic-pipe of the piston cooling-system. Only once during the six-months were the exhaust and inlet valves of the main engines changed, thus quashing another fallacy. Only once was a cylinder-head removed, and this was to replace a faulty and damaged piston-ring. No heads or liners cracked.

All work on the main engines, which was of a routine nature, was done by the engineers personally when in port, and all similar work on the auxiliary engines and machinery was done while under way at sea. The total cost of repairs amounted to $70. The auxiliary Diesel-electric engines worked perfectly through the trip, and were run at times over 500 hours without stopping. There was no involuntary stopping of the vessel at any time throughout the voyage.

Before proceeding further with the description of the voyage we will repeat a brief description of the ship herself from the June and August issues of Motorship, as well as give some comparisons with American steamships run on the same route.

m.s. WILLIAM PENN

Maximum loaded displacement	17,100 tons
Deadweight capacity	12,375 tons
Net-cargo capacity on 10,000 miles voyage (maximum)	11,725 tons
Fuel required on 28,500 miles voyage	1,475 tons
Fresh water required on same voyage	77 tons
Most suitable loaded speed	11 knots
Best day's average speed on maiden voyage	12.80 knots
Average loaded speed maintained	10.65 knots
Average loaded speed, New York to London, via the two canals	11.01 knots
Actual cost of fuel for 28,500 miles voyage	$26,041.92
Actual cost of lubricating oil on same trip	$1,864.63

SISTER STEAMER

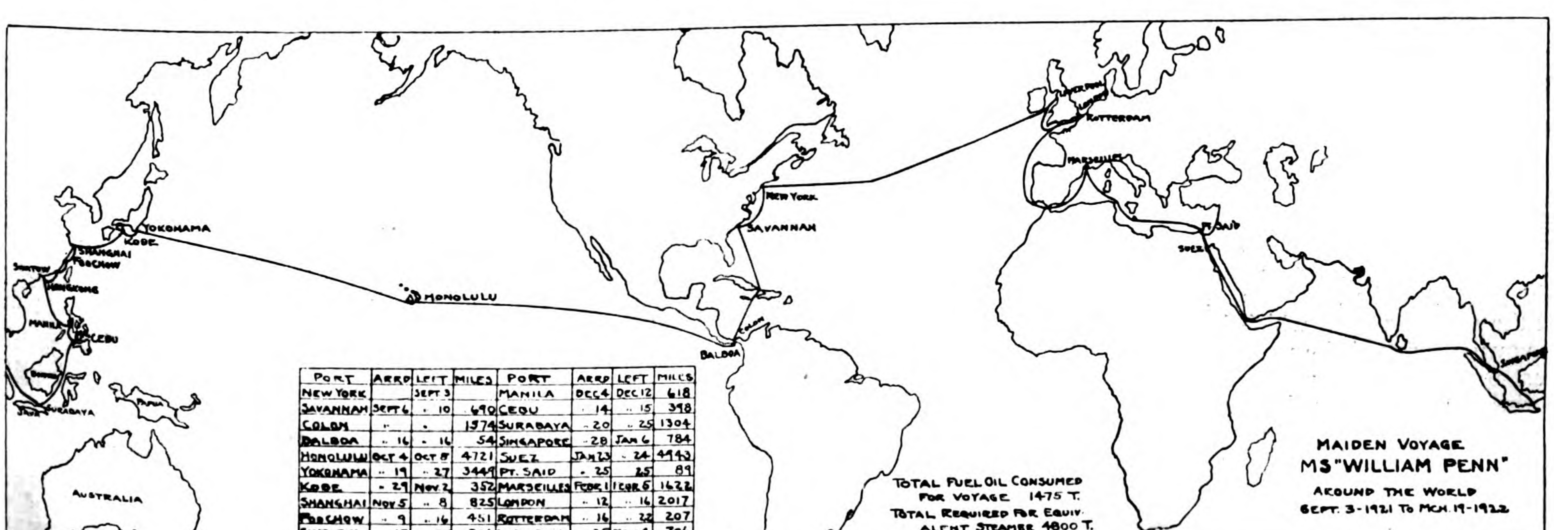
Fuel-consumption of sister steamer on same voyage	5,099 tons
Fuel bill of said steamer on same voyage	$80,318.25
Lubricating-oil bill of said steamer on same trip	$1,117.25
Fresh water required by steamer	263 tons

m.s. WILLIAM PENN

Length (O. A.)	455'0"
Length (B. P.)	445'0"
Breadth (M. D.)	60'0"
Depth (M. D. to S. D.)	36'8"
Draught (loaded)	28'4¾"
Gross tonnage	8,168 tons
Net tonnage	5,214 tons
System of Construction of Hull	Isherwood
Power (Indicated)	4,500 h.p.
Power (shaft)	about 3,500 h.p.
Fuel-capac. (inc'l 57 tons in settling tank)	1,343 tons
Deep tank (for dry cargo or water ballast)	994 tons
Cubic-capacity of deep tank (cargo)	34,770 cu. ft.
Hold capacity	520,550 cu. ft.
Total cubic capacity for cargo below decks	555,320 cu. ft. (bales) or 627,830 cu. ft. grain
Propellers (bronze twin four-bladed)	13'6" dia. by 11'9" pt.
Propelling engines	Burmeister & Wain 6 cylinder-four cycle
Cylinder bore	740 mm (29.134")
Piston stroke	1,150 mm (45.275")
Engine speed (designed)	115 R.P.M.
Total number engine-room crew	14 men
Daily fuel-consumption in port	½ ton
Daily fuel-consumption at sea	13 tons

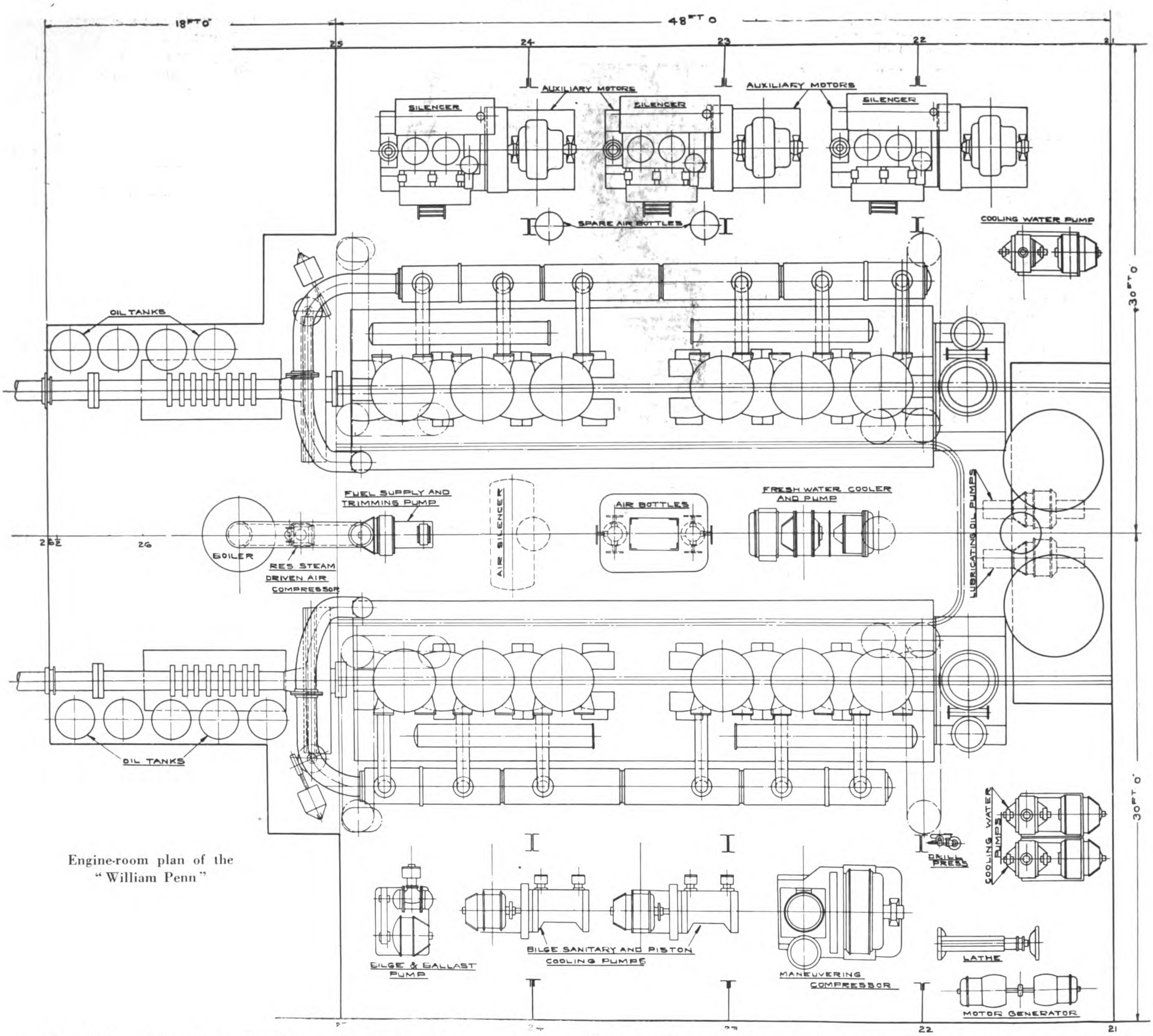
Her electric winches were developed by the Cramp Company to overcome the usual criticism of electrical winches as to speed, etc., the electrical equipment being supplied by the Westinghouse Company to special requirements and the winches constructed by the American Engineering Company.

While loading in New York the fuel-consumption with the six winches in operation was from 90 to 100 gallons, or about one-third ton per day. The "William Penn's" two main engines are of the regular four-cycle single-acting crosshead type, designed to develop 4,500 i.h.p. together at 115 r.p.m., and are direct-coupled to twin 14-in. dia. propeller-



PORT	ARR'D	LEFT	MILES	PORT	ARR'D	LEFT	MILES
NEW YORK		SEPT 3		MANILA	DEC 4	DEC 12	618
SAVANNAH	SEPT 6	" 10	690	CEBU	" 14	" 15	398
COLON	"	"	1574	SURABAYA	" 20	" 25	1304
BALBOA	" 16	" 16	54	SINGAPORE	" 28	JAN 6	784
HONOLULU	OCT 4	OCT 8	4721	SUEZ	JAN 23	" 24	4943
YOKOHAMA	" 19	" 27	3449	PT. SAID	" 25	25	89
KOBE	" 29	NOV 2	352	MARSEILLES	FEB 1	FEB 5	1622
SHANGHAI	NOV 5	" 8	825	LONDON	" 12	" 16	2017
FOOCHOW	" 9	" 16	451	ROTTERDAM	" 16	" 22	207
SWATOW	" 17	" 27	306	LIVERPOOL	" 25	MCH 4	706
HONGKONG	" 27	DEC 1	197	NEW YORK	MCH 19		3198

Chart of round-the-world voyage of the motorship "William Penn"



Engine-room plan of the "William Penn"

shafts via the old-type horseshoe thrust. They drive bronze propellers 13 ft. 6 in. dia. by 11 ft. 9 in. pitch, with four blades, designed and cast by Cramps for 11 knots speed.

There is hardly any need to mention that her engine-room machinery was installed by the Wm. Cramp & Son Ship & Engine Co. of Philadelphia, as this fact is now well known. Also that they have completed the four Diesels of similar power for the new big Merchant Shipyard built motorships *Californian* and *Missourian* of the American Hawaiian Steamship Co., which vessels will be operated by the United American Lines of New York.

At this point in our story we will compare the performance of the *William Penn* with two of the Shipping Board's steamers, which are of almost the same size and which have made the same voyages around the wrold. We will do our best to be impartial and unbiased, and to make these comparisons fairly. From a mechanical aspect we have no criticism to offer, as the reliability of modern steam and electric machinery is fully established, except that boilers and condensers often are more responsible for delays than Diesel-engines of today. It is from the economy point of view that our comments are directed. First of all we will give the consumption figure courteously furnished by Admiral Benson, Commissioner of the United States Shipping Board, who states that the results obtained by the Diesel-engine driven ship *William Penn* on her first voyage are most favorable, and would seem to justify the confidence of advocates of motorships in this form of propulsion for American merchant-vessels.

Below is a table supplied by the Admiral showing cost of fuel-oil and lubricating oil used by the *William Penn* on her voyage, and also a table showing the estimated cost of operating the *Eclipse*—a steam turbo-electric drive vessel—and the *Eastern Merchant*—a twin-screw Scotch boiler, reciprocating steam engine vessel—over the same run as the *William Penn*, a distance of 27,770 miles, together with other actual consumption. The comparisons are intensely significant.

We notice that the speed of the *Eclipse* has been given *as an average* of 10.60 knots, but this, we understand, was attained on her second voyage, and that on her maiden voyage to the Far East she averaged a speed of 9.87 knots over a distance of 25,759 nautical miles on a daily fuel consumption of 33.03 tons, compared with the *William Penn's* 10.65 knots on 13 tons per day; a tremendous difference that is almost unbelievable! As we have taken the maiden voyage figures of the *William Penn* it is only right to take the maiden voyage results of the other vessel for comparison.

FUEL OIL

William Penn	D.W.T. 12,375	Speed, 10.65 Knots	Fuel, 10,981 Bbl.	Cost, $26,041.92
Eclipse	D.W.T. 11,733	Speed, 10.60 Knots	Fuel, 33,420 Bbl.	Cost, 75,192.50
Eastern Merchant	D.W.T. 12,995	Speed, 11.00 Knots	Fuel, 35,697 Bbl.	Cost, 80,318.25

LUBRICATING-OIL

William Penn, 2,439 Gal.	Cost	$1,864.63
Eclipse, 1,316 Gal.	Cost	894.88
Eastern Merchant, 1,643 Gal.	Cost	1,117.25

FUEL AND OIL COSTS

William Penn	Total Fuel and Lubricating Oil,	$27,906.55
Eclipse	Total Fuel and Lubricating Oil,	76,087.38
Eastern Merchant	Total Fuel and Lubricating Oil,	81,435.50

N. B. The prices of fuel oil used are those obtaining at the time the William Penn made her run.

Furthermore, had the motorship shown defects upon her maiden cruise no mercy would have been shown the Diesel drive by its critics, and any cracked cylinder-heads or other troubles would have been "shouted from the house-tops" by the steam advocates.

To secure the better speed on her second voyage we understand that some changes had to be made to the machinery of the *Eclipse,* and that further alterations are now being made. Let us hope that similar treatment will be afforded new motorships if they ever need it.

Even before this the *Eclipse* had her machinery changed at a big expense, so she must have cost more than the motorship altogether. Originally she was a geared-turbine vessel, and her performance on a long voyage with this type of steam machinery was as follows:

S. S. "ECLIPSE"

Original Machinery

Curtis geared-turbine of 3,000 shaft h.p. with three Scotch Boilers having Milne Super-Heater of 50 degs. Fahr. superheat.

Results of Voyage in Mostly Heavy Weather

Distance	23,611 miles
Time	2,419 hours
Average speed	9.68 knots
Daily fuel-consumption	30.04 tons
Consumption per shaft h.p.	1.03 lbs.
Average power developed	2,422 s.h.p.

This data should be compared with the results made by the motorship *William Penn* in order to see how she compares with a geared-turbine vessel on her maiden voyage. Next we will give the *Eclipse's* performance on her maiden voyage as a turbine-electric ship, as follows:

S.S. "ECLIPSE"

Present Machinery before Superheat Installed

Curtis Turbine of 3,180 shaft h.p. and an A. C. Generator of 2,350 k.w. at 3,000 r.p.m. supplying a 3,000 shaft h.p. A. C. electric-motor on the propeller-shaft.

Results of Voyage in Mostly Mild Weather

Distance	25,759 miles
Time	2,608 hours
Average speed	9.87 knots
Daily fuel-consumption	33.03 tons
Consumption per shaft h.p.	1.28 lbs.
Average power developed	1,990 s.h.p.

To enable a proper comparison to be made we will give the leading dimensions of the *Eclipse* side by side with those of the *William Penn*:

COMPARISON OF MOTORSHIP AND STEAMER

	M.S. Wm. Penn.	S.S. Eclipse
Length, B.P.	445′	440′
Beam	60′	56′
Depth to Shelter Deck	36.67′	38′
Draft Loaded	28.39′	28.58′
Displacement Loaded	17,100 tons	15,700 tons
Deadweight	12,375 tons	11,867 tons
Cargo (Grain)	627,830 cu. ft.	589,355 cu. ft.
Cargo (Bales)	593,910 cu. ft.	552,969 cu. ft.
Designed Speed	11.5 knots	11 knots
Actual Speed (Maiden Voyage.)	10.65 knots	9.87 knots
Designed Engine Speed	108 R.P.M.	100 R.P.M.
Designed Power	3,500 S.H.P.	3,000 S.H.P.
Daily fuel-consumption	13 tons	30 tons

It will be seen from the above that the hull conditions are much more favorable for the *Eclipse* than for the *William Penn,* due to smaller displacement and finer lines of the former.

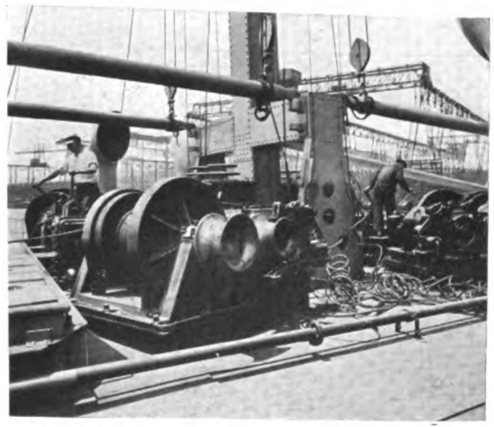
The shaft h.p. at the propeller of the *Eclipse* is less than that of the *William Penn* because of the loss of power in the electric transmission.

Although speed trials of a vessel do not show much other than that the engines are capable of developing their power, we will repeat the trial figures of the *William Penn* together with the speed trial results of six steam-driven hulls built at the same shipyard.

SPEED TRIALS OF THE WILLIAM PENN
(Mean of 3 Runs over Mile)

Speed averaged	12,592 knots
Indicated horse-power (Continental)	4,756 h.p.
Indicated horse-power (English)	4,690 h.p.
Revolutions	121.23 P.M.
Propeller-Slip	10.6%
Mean indicated-pressure	84.6 lbs.
Maximum i.h.p. attained over one mile	4,848 (Cont.)
Maximum i.h.p. attained over one mile	4,780 (Engl)
Maximum Revolutions	122 P.M.

The hull of the *William Penn* was a war-time contract, and was the last of a series of



A group of American Engineering Co.'s winches on the deck of the "William Penn." The electric motors are of Westinghouse construction

steamship hulls built at the Gloucester yard of the Pusey & Jones Corporation.

MEAN TRIAL SPEEDS OF SIX STEAM-DRIVEN HULLS BUILT AT SAME YARD

Type of Ship	Power	Revolutions	Mean Speed (Knots)
Geared-turbine	3,000 s.h.p.	70.2 / 90.2	7.7
4-cycle. quad.	3,600 i.h.p.	76	10.6
Geared-turbine	2,750 s.h.p.	90.6 / 85.7	10.5
Geared-turbine	2,750 s.h.p.	90.4 / 88.6	7.7
Geared-turbine	2,750 s.h.p.	91.9 / 90.6	9.8
4-cycle. quad	3,600 i.h.p.	77.0	10.8

The above results, when compared with the 12.6 knots mean speed attained by the motorship, tell their own story. What is the use of paying less for a steamer if she cannot do the same work? When comparing first costs an owner must compare a steamer of the size and power that can consistently do exactly the same work, both on trials and in service, as the particular motorship that the owner has in mind to build or purchase. Also it has to be borne in mind that a steamer can rarely maintain her trial speed over a long distance in service, whereas the better propeller efficiency of the motorship due to steady revolutions enables her to more closely maintain her trial speed. This is shown by the *William Penn.*

In Motorship of June last we made the following statement: "We feel confident that the *William Penn* will maintain at least one mile per hour better round-voyage speed (light and loaded) than the S. S. *Eclipse,* which will have nearly there hundred per cent (300%) greater fuel-consumption, while the *William Penn* will be able to carry about 10% more dead-weight cargo. This means a triple advantage, so the results will be most interesting when available."

It is obvious that our forecast was practically accurate! Judging by various voyages the *Eclipse* burns from 32 to 40 tons per day from bar to bar, depending whether 19 or 24 nozzles on the turbines are open, and correspond to speeds from about 9 to 10 knots. This works out at about 14.9 tons of fuel per 100 nautical miles, compared with 4.87 tons

per 100 miles of the *William Penn* from Singapore to Suez, and 4.94 tons from New York to London via the Far East. The *William Penn* burns only a small fraction of that burned in port by the *Eclipse,* and most vessels are in port longer than they are at sea.

Doubtless we have given sufficient comparisons to prove the case for the motorship, so we will continue with the record of the voyage of the *William Penn.* At Yokohama the first batch of cargo was discharged, and the vessel then proceeded in succession to Kobe, Shanghai, Foochow, Swatow, Hong Kong and Manila. At the latter named place unloading was completed and loading commenced for the return voyage. The next stop was at Cebu, Philippine Islands, and then passing between Celebes and Borneo she stopped at Surabaya, Java, where Christmas was spent, eight degrees below the Equator. The next port was Singapore, in the Straits Settlements, where loading was completed for the return trip. The next stop was at Suez, and, after passing through the Suez Canal, arrived at Port Said, where a small amount of cargo was taken out. The remainder of the cargo was discharged in turn at Marseilles, London, Rotterdam and Liverpool.

From the latter place the vessel sailed on the 6th of March for New York, in ballast, arriving on the afternoon of the 19th, after having experienced some very severe gales in the North Atlantic, the wind at times attaining a velocity of 110 miles per hour. On the return trip the vessel was not fully loaded, although the cargo was of very bulky nature, consisting of hemp, copra, rattans, tapioca, coffee, etc.

The total time required for the voyage, counting twenty-four hours to the day, was 197 days. The total number of days in port was eighty-six, and the total time at sea 108 days. About three days were taken up in passing through the two canals at the reduced speed of 48 r.p.m., up rivers, etc., from pilot boats to piers, and standby at pilot boats, etc.

The mean sea-speed from New York to London was 11.01 knots, with a mean consumption of 13.06 tons per day (exclusive of donkey-boiler). From Liverpool to New York, in ballast, the speed was reduced, due to the ship being in light condition, and to the very severe and almost continuous storms encountered in the Atlantic, as previously mentioned, the vessel averaging 8.9 knots, with a mean consumption of 13.15 tons per day (exclusive of donkey-boiler).

The best speed was made the last day out of New York, with 12.8 knots, and the main engines developing 4,700 i.h.p., thus proving that Diesel-engines do not fall off in power at the finish of a long run, as is usual with the steam plant. Compression cards were taken at this time, which showed that compression was normal in all cylinders.

The longest non-stop run was from Singapore to Suez, or 4,943 nautical miles, taking nearly eighteen days, with a mean sea speed of 11.48 knots, and mean total consumption of main and auxiliary engines of 13.41 tons per day. The consumption per i.h.p., main engines only, and all purposes was 0.3025 pound. The mean i.h.p. was 4,130 and r.p.m. 107.9, with a draft of twenty-one feet eight inches leaving Singapore.

On leaving Savannah the draft was 26 feet 5 inches and the mean sea speed from Savannah to Panama was 11.6 knots, with a consumption per twenty-four hours of 13.81 tons, and a consumption per i.h.p., main engines, all purposes, of 0.3055 pound. These consumptions are noteworthy, but usual with motorships.

In port, when loading or unloading, with two or three auxiliary Diesel engines in opera-

tion during the day, and one engine running for the twenty-four hours, the consumption for the auxiliary engines was about 150 gallons per day, or 0.48 ton, which is from one-twentieth to one-tenth that for an equivalent steamer. When one engine was operated for the twenty-four hours, without winches in operation (as over holidays), the consumption was about 110 gallons per day. The consumption of the one auxiliary engine at sea was 120 gallons, or 0.36 ton. The donkey-boiler for steam heating, etc., takes from 160 to 170 gallons per day, or 0.52 to 0.55 ton, when in use.

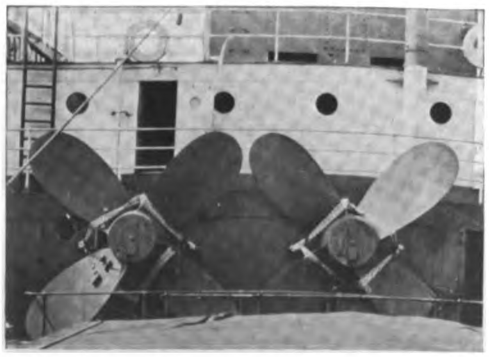
As already stated, the total consumption for the voyage was 1,475 tons. It is estimated for a steamer the consumption would have been 4,800 tons for the same trip, and it would have been necessary to have purchased 3,000 tons of oil abroad at higher prices, so the saving probably is higher than shown. On the outward voyage the deep tank was available for cargo, giving greater carrying capacity than that of the equivalent sister ships. The lowest full consumption record was from Honolulu to Yokohama, with 0.29 pound of oil per i.h.p., main engines, all purposes.

Considerable bad weather was encountered during the voyage, due to the time of the year. In addition to the storms in the Northern Pacific, after passing the 180th meridian, the *William Penn* passed through a typhoon on the way from Hong Kong to Manila, and met very heavy weather and head winds for four days from Port Said to Marseilles. Of the total of 108 days at sea, twenty-four were stormy.

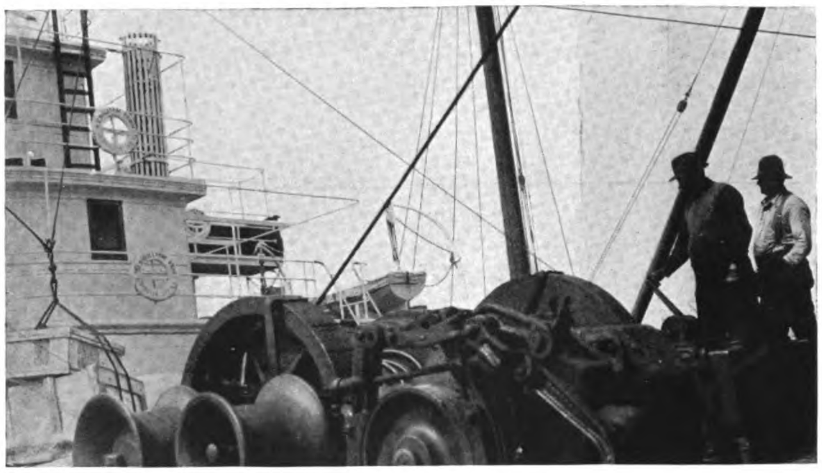
The *William Penn* has loaded for the Far East again, carrying chiefly heavy or dead-weight cargo, consisting mostly of structural steel, and with the vessel loaded down to the full draft marks. She is able to carry with this class of cargo about 1,000 tons more than the equivalent steamer, representing the additional fuel and fresh water necessary to be carried by the steamer. Accordingly a much better showing should be made over the equivalent steamer on the second voyage.

The interest which the Chief and his American engine-room crew take in the engines under their charge is reflected in their splendid condition and of the entire engine-room. Equally satisfactory as the main engines was the performance of the deck and engine-room auxiliaries. At every port the electric winches proved themselves to be in every way the equal, if not superior, to steam winches in the estimation of every stevedore and coolie handling the loading and unloading of cargo, although, perhaps, their loaded speed could be increased with advantage.

The chief objection heretofore on electric winches has been that they have been too slow on light hook-speeds, but the winches on the *William Penn* have been very satisfactory from this standpoint. Loading in New York the winches handled an average load of two tons, while at Savannah the load was six bales of cotton, about one and one-half tons. As holds No. 1 and No. 4 were filled with case-oil, which was not loaded by the ship's winches, only six of her ten winches were in operation loading there, and to run these six winches required a fuel-oil consumption of about one-third of a ton per day.



A spare pair of bronze propellers carried by the "William Penn"



Loading case cargo on the "William Penn." Note the ease with which the winches are operated by unskilled labor

For lubrication of the cylinders Vacuum D.T.E. extra heavy oil is used, for the air-compressors D.T.E. heavy X oil and for forced feed and hand lubrication D.T.E. heavy medium oil is used, the consumption per day for each kind averaging for the trip: For cylinders, nine gallons; for air-compressors, two gallons, and for hand lubrication and wick feed five and one-half gallons; a total of sixteen and one-half gallons per day.

The average daily consumption of fuel-oil for the world-voyage was thirteen tons. The following statement of fuel-oil consumption for the voyage will likely prove of great interest, this data having been given to MOTORSHIP by Chief Engineer Olson:

Total fuel-oil used at sea, main engines and auxiliaries ....428,713 gals. (10,207 bbls.)
Total fuel-oil used at sea for donkey-boiler..5,650 gals.
Total fuel-oil used in port for donkey-boiler and auxiliaries ....23,068 gals.
Total fuel consumed for all purposes......457,599 gals. (10,895 bbls.)
Total fuel-oil bought for ship..........482,419 gals.

The following condensed figures for the world-voyage of the *William Penn* should prove interesting:

Total running-days on passage....108 days, 11 hrs., 12 min.
Total lay-days on passage..........92 days, 10 hrs., 42 min.
Total time on passage......200 days, 21 hrs., 54 min.
Total distance by observation......27,763 nautical-miles.
Total distance run (including distances from pilot to dock) ....28,567 nautical-miles
Total distance by engines......32,177 nautical miles
Average slip for voyage..............13.7 per cent.
Average speed for voyage..............10.65 knots.
Total revolutions for the voyage........16,648,380.
Number of times ship stopped on account of engine-trouble .... None.
Number of times engines stopped at sea because of trouble ....One engine stopped for a few minutes.
Fuel-oil consumption per day at sea........13 tons.
Fuel-oil consumption per day in port.........½ ton
Lubricating-oil consumed per day at sea...16½ gals.
Number of engine-room crew..............14 men.
Total cost of machinery repairs..............$70.00.

At many of the ports touched motorships are rarely seen, so that agents for supply houses selling ship and engine stores are not yet acquainted with the fact that a motorship does not have to purchase the various items that a steamer does on a long voyage. As usual, at each port these agents swarmed aboard and promptly went ashore again, as they found that about all that this ship was buying was a little food, wondering what was to become of their business when all the ships that entered were like this. Chief Olson had quite a task, he says, trying to convince some of these agents that the ship had been over half way around the world and hadn't bought fresh water, lubricating oil, grease, gasket material, graphite, etc. We were with Chief Olson on the ship at New York when a clerk from the office of Capt. Hartley, marine superintendent of the line, came aboard to check the amount of engine-room stores and spares which had been used on the voyage, and as item after item was read off Chief Engineer Olson would almost invariably reply: "We hardly touched them; they are most all there."

Although America has been backward, compared with other countries, in adopting the large motorship for the deep sea trade, it is hoped that the M/S *William Penn* has shown the way and that there will soon be laid down a large number of motorships, which are so vital in the maintaining of the American flag on the sea.

HEATING MOTORSHIPS BY ELECTRICITY

The installation of electric-auxiliaries throughout motorships has saved great cost of piping necessary for steam-auxiliaries. Not only are safety, appearance, convenience and economy served by substituting electrical for steam-auxiliary equipment, but much unnecessary heat in hot weather is avoided through not having steam piping about the cabins.

But one of the most attractive uses of electricity is that of heating cabins and staterooms individually by radiators which can be connected up with the ship's regular lighting system when needed and simply disconnected just as one would handle a vacuum-cleaner or electric-iron connection. When it is generally realized that such a radiator is available which looks and acts like a steam-radiator, but lacks its defects, we believe that it will be widely used.

Such an electro-vapour radiator is now in use, one single order having been placed for over 400 radiators for motorships. As many motorships have no donkey-boiler, but depend upon electricity for heating, our readers will likely be interested in learning more of this radiator. This is manufactured by Benham & Sons Ltd. of London, England, and appears to solve the heating problem. One of the principle claims made for this equipment is that even diffusion of heat over a room is obtained so that the whole room is warmed rather than only the portion near the radiator. This radiator is non-luminous, the heat being generated by an electric-element contained in a water-reservoir, which only requires to be re-filled about once a year.

Not only are "Electro-Vapour" radiators supplied, but existing steam-radiators can be converted into this type.

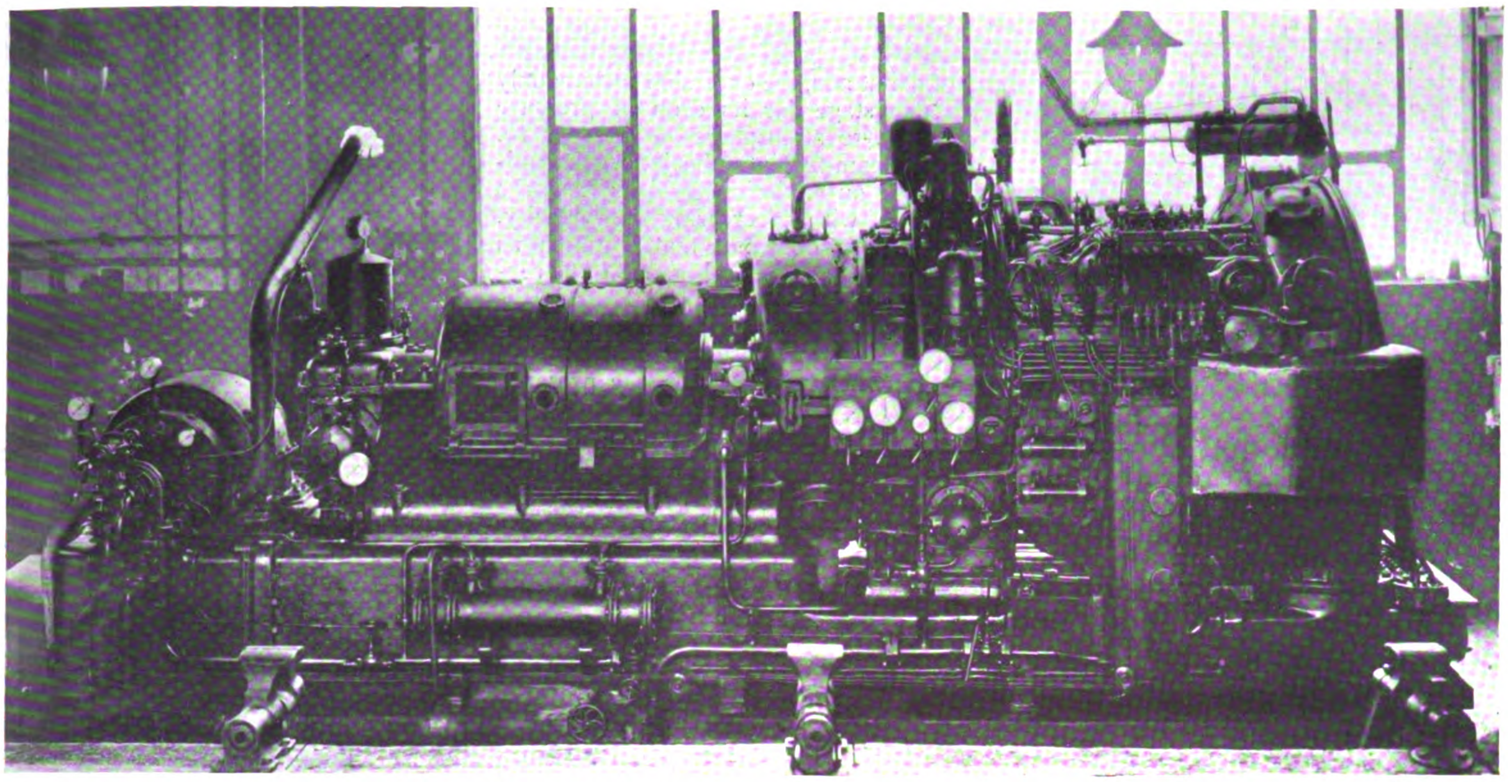


Fig. 9.—The 1,000 h.p. Thyssen-Holzwarth gas turbine

Thyssen-Holzwarth Oil and Gas Turbines

Extract from Treatise in German by Professor W. Schüle, Translated for "Motorship" by Hans Holzwarth, the Inventor of This Unique Internal-Combustion Engine

THE question has to be decided whether or not oil and gas turbines built up to the present time meet the conditions imposed by the operating functions and conditions of modern power work. Scientific considerations, historical comparisons and especially tests made by Professor W. Schüle with the Holzwarth gas-turbine lead him to the conclusion that so far only the Holzwarth gas and oil turbine built by the Maschinenfabrik Thyssen of Mulheim Rühr answers these very difficult conditions—difficult in consideration of the high standing, reliability and efficiency of gas and oil piston-engines. Economically the Holzwarth gas-turbine has already equalled the steam-turbine, and the tests now underway shows a tendency to further increase economy towards that of the gas piston-engine.

Thermodynamically the Holzwarth gas-turbine is superior to the gas piston-engine and the combustion turbine of Armengand Lemale in all degrees of compression. At low compression none of the other processes—it is claimed—can compete with the Holzwarth process. Fig. 1 clearly indicates this. A thermodynamic efficiency of 45 per cent is attained with the Holzwarth process at a compression ratio of 3, with the combustion turbine at a compression ratio of 10, and with the piston engine at a ratio of 12. In the explosion and combustion turbines air and gas are compressed in a separate auxiliary compression apparatus, while the piston-engine also operates as a compressor.

Therefore the efficiency of compression will be greater with the piston-engine than with the turbines, and it is very important to perform this compression work in turbines at lower stages than in piston-engines, as does the Holzwarth turbine. In all combustion-engines the temperature at the beginning of the expansion process is about 1,500-1,700

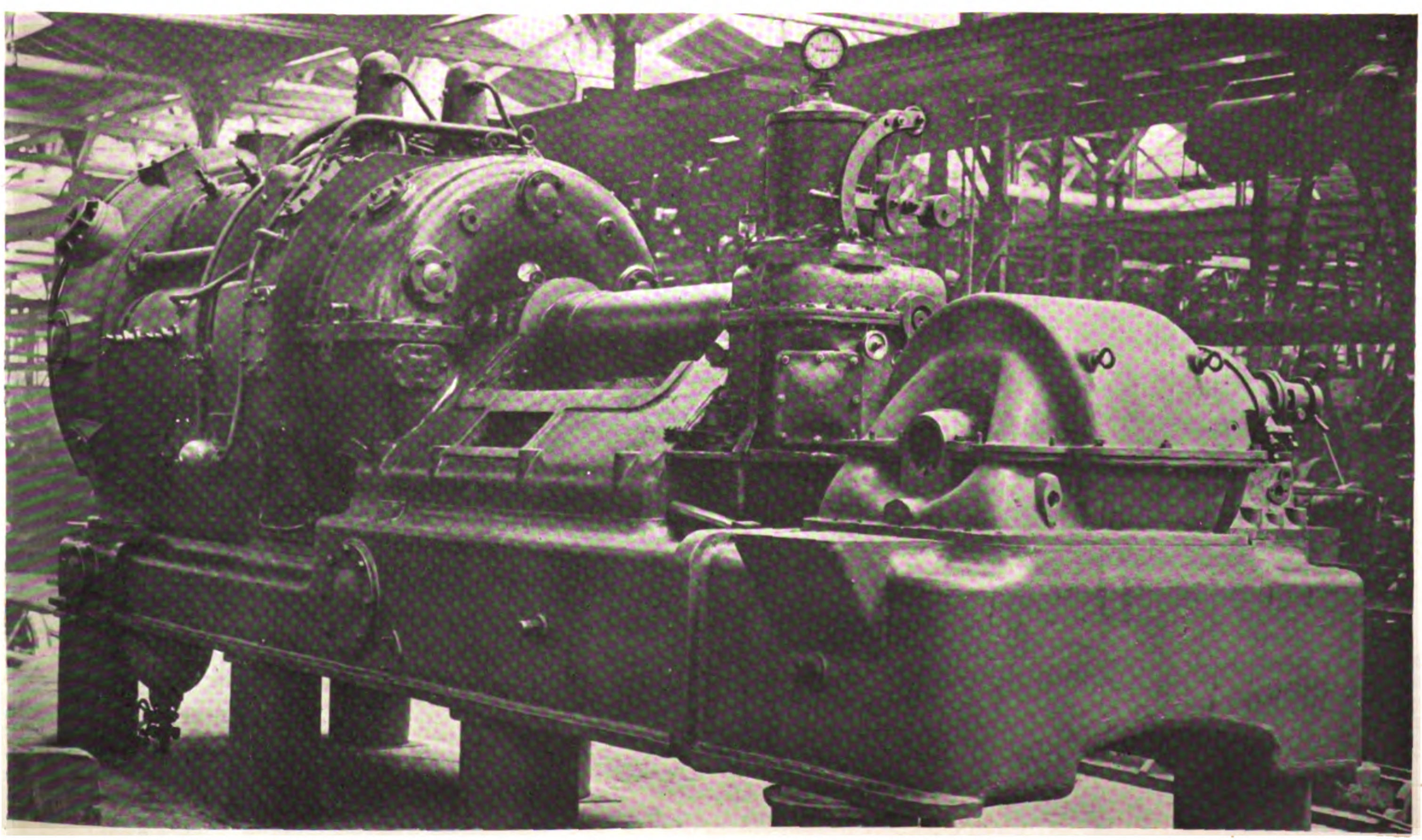


Fig. 8.—The 500 b.h.p. Thyssen-Holzwarth oil turbine, which may be t he power of the future for merchant ships

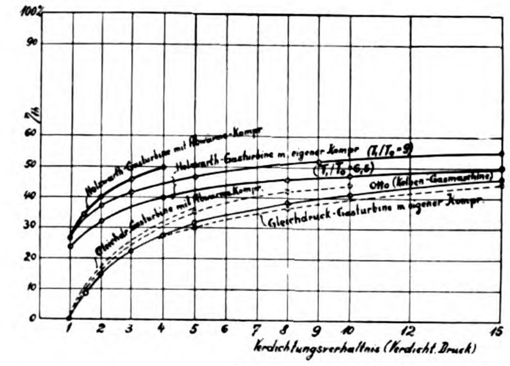


Fig. 1

centigrade and at the end about 1,000 centigrade. The expansion process is the working process.

Consequently all the working parts have to deal with these temperatures, and the way to withstand these temperatures is utilization of the piston-engine design, the same as in the Holzwarth design. The time during which these high temperatures prevail, must be very short and following it must come a period of low temperature. The rhythmical change be-

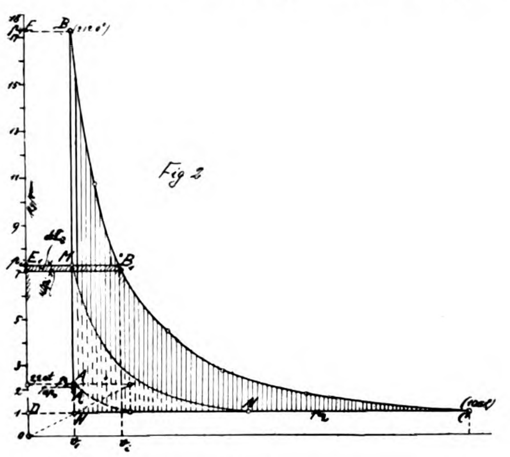


Fig. 2

tween high and low temperatures makes the explosion-turbine of Holzwarth just as safe as the piston-engine. Absence of this rhythmical change makes a combustion-turbine impossible.

Any step to cool these high working-temperatures by mixing steam with the combustion gases is wrong thermodynamically as well as from a practical aspect.

While the steam-turbine requires many stages, according to the drop of steam pressure from 190 lbs. p. sq. inch to 28½ inches—a ratio of about 260, the explosion turbine only requires one stage for its drop of pressure from 230 lbs. to atmosphere—a ratio of 16. But in the steam-turbines the jet works uniformly, while on explosion turbines it works like a shot with decreasing jet-velocity. Fortunately, this does not matter much as shown by Figs. 2 and 3. In Fig. 2 B.H.C. represents the p.v. diagram of the Holzwarth-turbine working with a compression of 2.2 at atmospheres and an explosion pressure of 17.3 at atmospheres absolute. While the pressure decreases during the expansion from 17.3 atmospheres abs. to 7:3 atmospheres abs. the part of the energy marked with vertical lines has been transformed into kinetic energy and only the small balance below M.N. is left.

Fig. 3 shows that the jet-velocity decreases slowly until about 90 per cent of the total energy is transformed into kinetic energy. Only during the last 10 per cent, which is not of much importance, the decreasing of the jet-velocity takes place at a quicker ratio. Therefore, the turbine efficiency of the one stage is not much lower than that of a similar steam-turbine wheel. The shocks which the running vanes have to stand in the Holzwarth turbine are, of course, much greater than with steam-turbines. But they easily stand these shocks, due to construction and material.

Fig. 6 shows the method of securing the vanes to the running wheel. The material is soft iron with no nickel or chrom addition.

Fig. 5 shows the section through a 10,000 K.W. gas-turbine of 1,500 h.p. A model of this size gas-turbine in 1/10 scale, partly cut to show valves, explosion chamber, nozzles and wheel, was exhibited by Maschinenfabrik Thyssen at the Electro Exhibition in Essen, June, 1920. It attracted considerable attention.

Fig. 7 shows the 500 b.h.p. oil-turbine on the test-bed in the plant of the Maschinenfabrik Thyssen. It was intended to exhibit the same instead of the model, but the exhibition building was not suitable. During the tests Schüle discovered that with all 6 chambers of the oil-turbine in operation, there was an average temperature in the explosion chambers of 470-550 Cent. and a temperature of 430-470

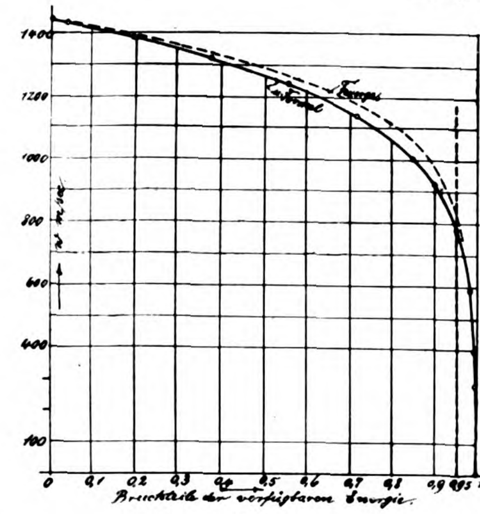


Fig. 3

Fig. 6.—Method of securing the vanes to the running-wheel

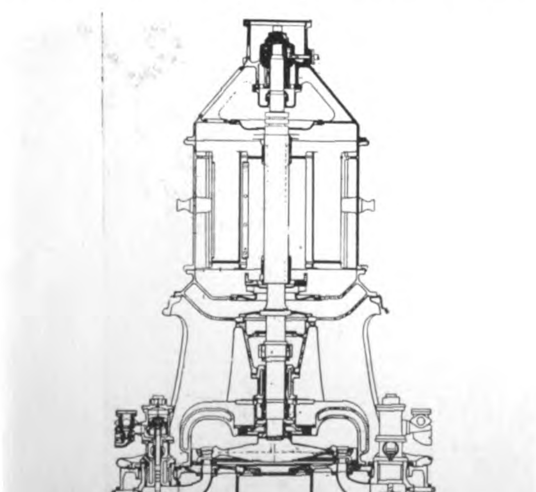


Fig. 4

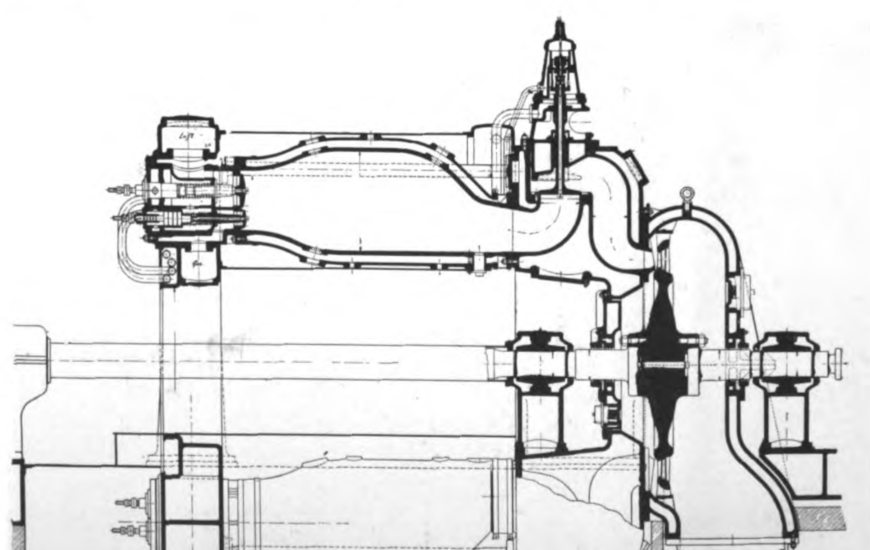


Fig. 5.—Sectional view of the Thyssen-Holzwarth 1,500 b.h.p. gas turbine

cent. in the turbine wheel housing. Only 9% of the total heat was transmitted into the cooling-water surrounding the explosion chambers. (In Diesel-engines up to 50% is lost in the cooling-water.) This is due to the very short duration of expansion (less than 1/10 seconds) and means that practically all the heat not transformed into energy at the shaft remains in the mixture of exhaust-gas and scavenging-air leaving the oil-turbine at about 450 Cent. It is very essential to make further use of this exhaust heat by producing steam, and driving the little steam-turbine blower.

With the vertical 1,000 h.p. Thyssen experimental gas-turbine Schüle has already made several tests, and is still carrying on experiments. He reports that he found the machine in an absolutely safe working condition, and that he could carry through his tests without any trouble. With a compression of 2.2 atmos. abs. he found with a wheel having but one set of vanes an efficiency of 25% when developing 1,200 h.p. Further tests show a tendency of an increasing effective efficiency and Schüle concludes with the remark that the time will soon come when the effective efficiency of the Holzwarth gas-turbine will have reached a position halfway between the steam-turbine and the gas piston-engine. In developing the Holzwarth turbine to a practical engine of the highest economy the Maschinenfabrik Thyssen will produce a new and powerful unit for world economy of energy.

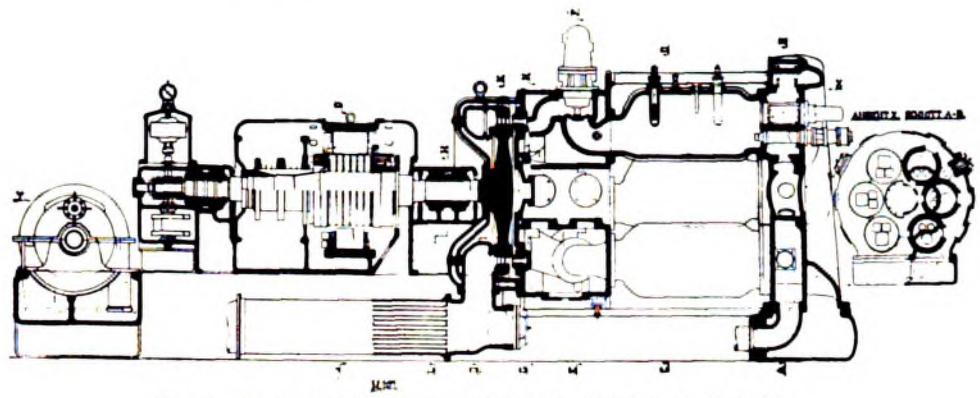


Fig. 7.—Section of the Thyssen-Holzwarth 1500 b.h.p. oil turbine

Departing from Standard Marine Engineering Design

Why the Fullagar Oil-Engine Differs from Customary Practice

DURING November last we read a paper before the Pennsylvania Section of the Society of Automotive Engineers, dealing with the increasing variation in types of marine Diesel engines, illustrating the same by slides. In this paper we pointed out that there were at least twenty different makes of engines that radically differ from each other in design, which left non-technical shipowners somewhat bewildered. We also queried whether it would or not be advisable for Diesel-engine builders in future to avoid striving to produce something radically different from other designers.

Among Diesel engines built for marine and stationary purposes the Fullagar probably differs more from customary practice than any other design. Substantial reasons for this departure are put forward by the designers of the Fullagar engine, which have been supported by 9 big British, Japanese and French engineering concerns including Cammell-Laird & Co. and John Broun & Co., all of whom have taken out licenses and commenced the manufacture.

In the first place, the object in view was to produce an engine lighter and more compact than any other types now in use, and to obtain these qualities without increased stresses, bearing-pressures and mean effective-pressures above those established as good practice for regular Diesel engines. On the contrary, it is claimed that these factors are kept below usual practice in the Fullagar design. It is also claimed that great economy in space and weight has been derived directly from the Fullagar oblique rods, by means of which the upper piston in one cylinder is tied directly to the lower piston in the adjacent cylinder. By this, the number of connecting-rods are reduced to one per pair of opposed pistons instead of three as in other types of opposed-piston engines. Also, because of this arrangement, every positive acceleration of the reciprocating parts is produced directly by the pressure of combustion, and every negative acceleration is cushioned by the compression of the air.

Thus, in the Fullagar engine only net working-loads reach the connecting-rods and are transmitted to the cranks. There are therefore no negative loads transmitted from one crank to another to accelerate reciprocating parts or to compress the air for combustion. This eliminates reverse stresses in the crankshaft, and is an added factor of safety. The connecting-rods transmit net working loads to the cranks for each stroke of each cylinder, thus reproducing the ideal action of the steam engine connecting-rod. Four connecting-rods and eight oblique rods transmit eight power impulses per revolution to the four cranks of a four-cylinder engine.

In another well-known type of opposed-piston engine eight power impulses per revolution would also be delivered by a four-cylinder engine, but twelve connecting-rods and eight vertically moving rods acting on twelve cranks are necessary to accomplish this result. In a standard four-cycle engine, it is claimed, sixteen connecting-rods, sixteen-cylinders, and sixteen cranks would be necessary to give the same number of power impulses per stroke and the safe torque as the Fullagar engine gives with four-cylinders of the same diameter and twelve rods: in all, four connecting-rods and eight oblique rods.

Objections to the Fullagar oblique rods by means of which these most desirable results are accomplished have been raised as follows:

(1) That the multiplicity of rubbing surfaces produces excessive friction.

(2) That the horizontal components of the stresses in these rods produce an objectionable fore-and-aft moment in the engine frame.

(3) That in the case of a piston seizing these rods will buckle and cause a wreck. To these the U. S. representative replies:

(A) There is nothing strange or objectionable about oblique rods *per se* in a reciprocating engine. Every such engine has them, in the form of connecting-rods. The pressures transmitted to the frame by the Fullagar oblique rods are taken care of in the same way and just as safely as the pressures from connecting-rods in all reciprocating engines. As to the total number of rubbing surfaces and total friction produced thereon, this is less in a Fullagar engine than in a four-cycle engine having the same number of power impulses per stroke, about the same as in other types of opposed-piston engines, and greater, in a ratio of about twelve to eight, than in a corresponding-two cycle engine of the usual design.

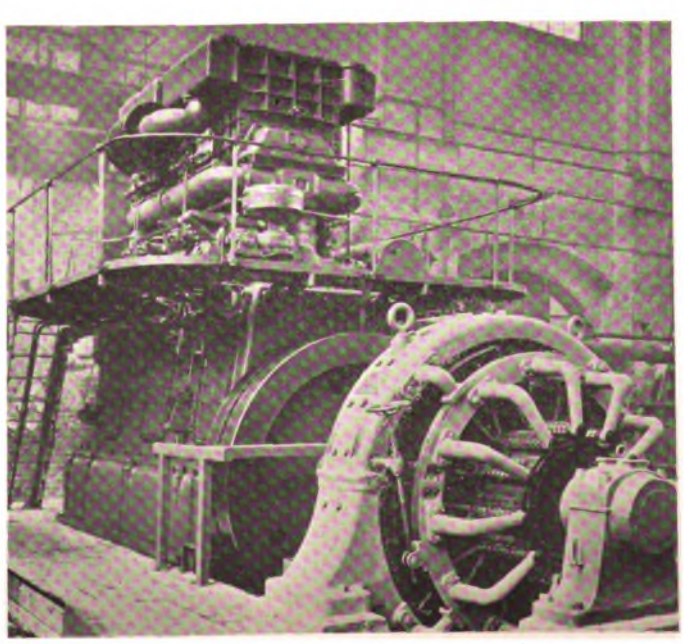
(B) Consideration of all the fore-and-aft moments shows that the net moment delivered to the frame is of no importance in the Fullagar design, but on the contrary that this design eliminates bending and rocking moments of far greater amount found in other usual types of Diesel engines.

(C) There is no more reason for Fullagar oblique rods to buckle should a piston seize than for a connecting-rod of usual type of engine to buckle under the same conditions. The stress limits allowed, taken in conjunction with their ratio of length to diameter, makes them perfectly good as columns to take any stress that can come on them under the condition referred to, without buckling.

Fullagar		Opposed-Piston Type		Four-Cycle Type (Average of 3 well-known makes)	
Length	= 1	Length	=1.53	Length	=1.60
Height	= 1	Height	=1.06	Height	=1.10
Weight	= 1	Weight	=1.60	Weight	=1.92
Piston speed	= 1	Piston Speed	=1.00	Piston Speed	=1.51
*R.P.M.	= 1	R.P.M.	=0.78	R.P.M.	=1.00

* = 124 revs.

Diagram showing ratios of height, length, weight, piston-speed, and R.P.M. of well known engines of opposed-piston and four-cycle types to Fullagar engine of same power, and same R.P.M. or piston speed.



750 b.h.p. Willans & Robinson-Fullagar Diesel-electric generating set

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MOTORSHIP

Trade Mark, Registered

Published Monthly in the Interests of Commercial and Naval Motor Vessels and for Recording International Progress of the Marine Internal-Combustion Engine

Head Office: 282 WEST 25TH STREET, NEW YORK, N. Y.

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Cable Address—Freemote New York

Copies of "Motorship" can be secured by placing orders at Smith and Wyman's railway bookstalls in Great Britain; also from Hubert Hermanns, Kissingenstrasse 2, Berlin-Pankow, Germany, or from the American News Co., New York City, U. S. A., and on the Pacific Coast from the San Francisco News Co.

Published by MILLER FREEMAN & COMPANY

MILLER FREEMAN .... President
THOS. ORCHARD LISLE .... Editor
A.M.S. Naval Engineers. A.M.I. Marine Engineers.
RUSSELL PALMER .... Manager

Subscription rates: U.S.A. and Mexico, $3.00 per year; Germany, 300 marks; Canada and foreign countries in the postal union, $3.50. Single copies: United States, 25c.; Great Britain, 1/6. Other countries, 35c.

"Motorship" is published on the 20th of the month prior to date of issue, and all changes in and new copies for advertising must be in the hands of the publisher prior to the 5th of each month. Notice of discontinuance of advertising must be given before the 1st of the month, preceding issuance.

A CONVINCING PERFORMANCE

WHEN she docked at the Barber Line pier in Brooklyn the Shipping Board's motorship "William Penn" finished a record never before equalled by any American ship of her size and power. Her performance on her maiden voyage around the World at eleven knots with less than one-hundred dollars spent in repairs and docking in a condition for immediate departure has established beyond question the reliability of the direct-drive system of Diesel propulsion. And, in a same measure her profitable operation has definitely established the tremendous economy to be derived even with a higher first cost than a steamer. We understand that she netted a profit of about one-hundred and eighty-thousand dollars to her operators on the outward voyage, and little more than paid her way on the homeward trip. Quite a sum in these times of scarce cargoes and low freights!

But there is no pleasure without regret! It has taken the Board over four years to find out for themselves what they now know as the result of this voyage. Now that every official of the Board is thoroughly convinced of the vast all-around superiority of the motorship there is no money nor authority to build a fleet of similar economical vessels, but instead the country is saddled with 1,400 almost useless and practically antiquated craft. Yet the Board has discovered nothing that hasn't been demonstrated and proven in the pages of MOTORSHIP a thousand times during the past six years. All that has been accomplished by this fine performance is the confirmation of our claims which many shipowners and their consulting-engineers derided previously. This in itself would be important were it not almost too late.

The "William Penn" has also converted to Diesel power the firm who operated her on this voyage, so we are not surprised that they offered the Board $32 per ton for her just when Chairman Lasker told the Joint Congressional Committee that the World's market value of good steam tonnage to-day is $30 per ton. In turning down this offer the Board silently acknowledge the superiority of the motorship. From a design and construction aspect we do not consider her an ideal or even a very good ship as we intimated before her departure some months ago. Her block coefficient does not allow of easy drive, particularly in heavy weather, her accommodation is poor, and following her trials several thousand rivets were condemned and she had to go to dock. It was solely due to her machinery and its careful installation that she performed so well. That machinery is Diesel power! Because of this she is a valuable ship in this period of economical entrenchment.

To enable a steamer to average the same round-world speed as the "William Penn" it would be necessary to equip her with higher powered machinery—say about 750 i.h.p. greater, which would increase her first cost, overhead and operating charges, etc., and possibly make one more fireman necessary, as well as weigh more and occupy more space and increase the fuel-consumption to a total of about 50 tons per day, compared with the 13 tons of this motorship. Also the bunker space would have to be further increased, thus making another reduction in the net cargo capacity by both weight and volume. To carry the same quantity of net-cargo the same distance as this motorship a steamer would have to be nearly a thousand tons larger, consequently would be just as expensive to construct, especially as this additional tonnage means more power again and extra fuel-consumption. All a shipowner has to do is to plan a steamer to carry 627,830 cubic-feet of bulk-cargo, or 11,500 tons of weight-cargo as well as fuel a distance of 15,000 to 20,000 miles at an average sea-speed of a little over 11 knots without re-bunkering, and then compare her dimensions, power, crew and cost with those of the "William Penn."

NEED FOR QUICK ACTION

TWO things doing more than trade depression to demoralize shipping and shipbuilding at the present time are the slowness of Congress in passing necessary legislation and the absence of the establishment of a definite policy by the Shipping Board. The latter, of course, cannot do much until the new Merchant Marine bill becomes an Act. Early action in the case of the Board's plans will greatly assist to revive certain new constructions in prospect and numerous conversions to more economical power of many vessels now laid-up with machinery that is almost useless. Existing indefinite conditions are intolerable and are acting as a bar to all development because shipowners "are absolutely at sea." With the present high cost of construction few owners dare place contracts, as they may be faced with hundreds of vessels thrown on the market at low prices and easy terms, necessitating immediate writing-off large sums of money in new shipping values on their books.

During the last few months Diesel-engine builders have been almost bombarded with enquiries and requests for estimates, but little tangible has resulted because shipowners are floundering in mid-ocean. If the proposed legislation is finally drafted-out along sensible lines and a sound policy immediately formulated by the Board and acted upon without smothering the shipowner with red tape and restrictions, the shipyards, Diesel-engine plants and accessory-equipment factories will soon be in the midst of a miniature boom and with sufficient work in sight to keep many of them reasonably busy for two years. There has been enough dallying and it is time to get back to serious business, otherwise we may as well wake-up from our mercantile-marine dream.

UNDERSTANDING THE PSYCHOLOGY OF PUBLICITY

MANY manufacturers commence their advertising campaigns when *they* are ready, particularly if they are introducing a new model or new product. If they don't receive a prompt response they generally blame business conditions or the advertising medium, forgetting that the buyer buys when *he* is ready—not just because the seller is ready. And, you can't tell when the buyer is ready unless he has advised you. Hence, consistent and regular advertising is imperative to produce successful results. It is undisputable that good advertising when steadily maintained is profitable, no matter the nature of the product advertised or the general state of business. Sometimes the advertising "copy" is hastily and poorly drafted and fails to convince the potential purchaser, so a competitor's "story" sounds better to him if the product is actually inferior.

You know your own product and may sincerely believe it to be the best, but you have to tell your facts well and tell them consistently to convince the prospective buyer. Command attention by regularly using advertising space in the best medium in the marine field. That medium is the magazine you are holding in your hand. Others are reading this publication including the men to whom you wish to sell. Convince them with a most carefully-worded story like this must convince you if it is to produce results, and afterwards sends your sales-engineer to clinch the deal. Then your investment will be profitable! Why not think it over and write us your conclusions?

THE DIESEL FUEL-OIL SITUATION

WHILE several months ago some of the leading oil-companies advised us that the price of Diesel-oil was to be considerably increased owing to the available supply being required for other purposes, including cracking under pressure stills for gasoline, there have not yet been any visible signs of an application of the raise. In fact the reverse is actually the case and Diesel-oil as well as boiler-oil is cheaper than ever. About a week prior to closing for press with this issue we were shown the quotation of a prominent oil company made to a New York shipowning firm for supplying bunkers in New York harbor. Diesel fuel of 21.26 degrees Baumé containing 3/4 of 1 per cent sulphur was offered at $1.57 per 42-gallon barrel, and boiler-oil of 14.16 degrees Baumé at $1.15. We also learn that at some foreign ports, such as Singapore, Diesel-oil can be purchased at the same cost as boiler-oil.

How long these conditions will last is difficult to say, because fluctuations in the oil market are exceedingly changeable and have undergone wide variations during the past few years. But while they last there is no urgent necessity for a motorship owner to run his Diesel engines on the heavier oil except to give experience to his ships' engineers, because the daily consumption of a 12,000 tons deadweight motorship of 12 knots speed is so small that a difference of 32 cents per barrel will only mean $31 per day at sea and $1.50 per day in port, or an approximate annual total of $5,415.00, allowing 200 days in port and 105 days at sea. In this we have not taken into consideration the advantage of the motorship being able to bunker a six months' supply at the most favorable port without encroaching on her cargo space or weight capacity.

But there is no knowing exactly the intentions of the big oil companies a few months ahead, and the existing condition may only be temporary. So every prospective motor ship-owner should wisely

arrange in advance for all his Diesel installations to be equipped with appliances that will enable heavy boiler-oils of 14 degrees to 18 degrees Baumé to be used at any time. Any good make of Diesel engine in the hands of a conscientious and experienced operator can burn such oils without any real trouble, provided the necessary heating and filtering apparatus is provided. On the other hand even if the leading oil-companies crack the Diesel-oil (solar-oil) for gasoline, the smaller companies cannot afford to install the necessary cracking plants, so about 30 per cent of this country's supply of gas-oil will always be on the inland and coast markets, as it would to an extent be a drug on the hands of the lesser companies if not disposed of for driving oil-engines. It will be remembered that the figures given us by four domestic oil-companies last December averaged $2.52 per barrel for Diesel-oil and $1.68 per barrel for boiler-oil in New York. As Diesel-oil can now be obtained almost as cheaply as boiler-oil, the operating costs are overwhelmingly in favor of motorships, particularly because the latter vessels carry more cargo and average a better speed than the steamer.

DIESEL-ELECTRIC DRIVE FOR YACHTS

Even the casual reader must have noted the increasing number of recent installations of Diesel-electric power in yachts. Our pages have often referred to these with an ever-present realization that in the realm of motor-yacht design the Diesel and the Diesel-electric drive must be considered as firmly established. The ultimate economy and reliability of these powers cannot be ignored and it seems now hardly possible that any large steam-yacht will be constructed in the future. However, there is still the question as to whether the new propelling-power shall have direct Diesel-drive, reduction-gear drive, or whether the Diesel-electric type shall be generally adopted. This question we do not feel ourselves either called upon or inclined to answer at this juncture, but we do feel that attention should be called to the characteristics of Diesel-electric power, the opportunities which exist for the use of this type and the salient features of installations already made.

Probably the chief consideration involved in the selection of the Diesel-electric drive is the desire to obtain maximum flexibility and refinement of control together with economical operation over a wide range of speed. Maneuvring ability is one of the most necessary qualities of a yacht and the Diesel-electric power permits of the engines running constantly in one direction without adjustment of revolutions, the speed of the boat being regulated entirely by varying the electrical output of the installation. This is so easily and delicately controlled and with such reliability that the controlling station can be located elsewhere than in the engine-room, preferably in the pilot-house where the man at the wheel may have not only the ship's wheel but the speed and direction of rotation of the propeller under constant and positive control at all times.

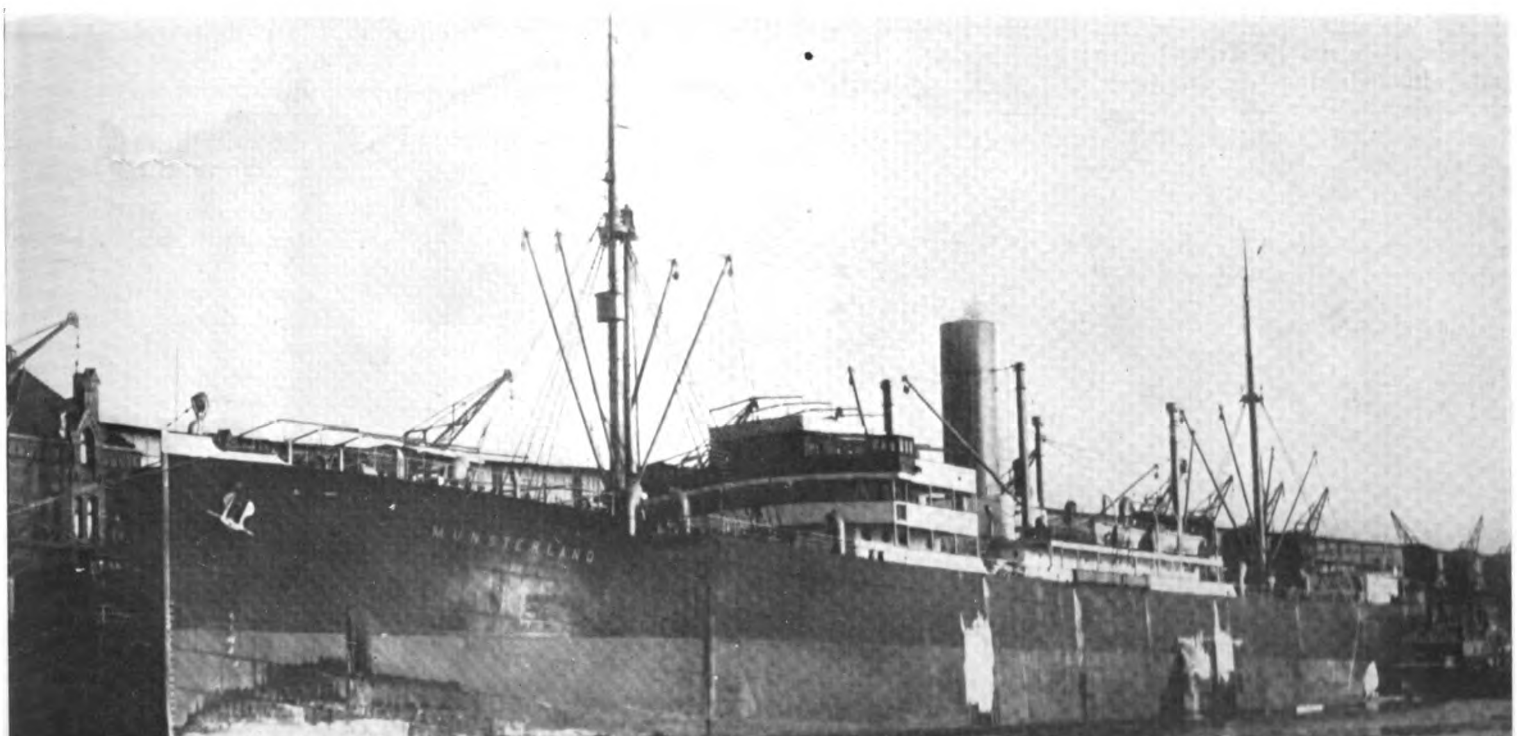
In Diesel-electric drive the several generating-sets are driven by Diesel engines of smaller size and higher revolutions than usual in a direct-drive Diesel-installation and of a type which has been built in great numbers so that it is possible to obtain an installation of relatively high horse-power by installing several well-tested standardized units to total such power. To the yachtsmen the attractive feature of almost total lack of vibration and very steady running of the electrically-driven propeller are items in favor of Diesel-electric drive. There is, however, considerable divergence of opinion on the subject and we find that some naval architects and consulting-engineers do not favor this type of power as against direct Diesel-drive. But undoubtedly many Diesel-electric driven yachts will be built and thoroughly tested and then the profession will be in possession of valuable data on which to base future installations. Divergence of opinion on engineering subjects is one of the factors contributing toward development and progress. Therefore, MOTORSHIP desires to place before its readers technical information regarding Diesel-driven yachts in order that the profession may have accurate, unbiased data on which to base conclusions as to what system yacht-installations shall be based upon.

COAL VERSUS OIL

AT the annual general meeting of Lamport, Holt, Ltd., Sir Owen Phillips, Chairman of the Board, referred to the operation of the motorships of their fleet. He stated that the continued high price of suitable fuel-oil prevents full advantage from being secured because on the basis of the present cost of oil and coal in Great Britain, there is only a small saving in the cost of fuel for the motorship as compared with the coal-burning vessel.

We presume that Sir Owen Phillips is assuming that all fuel-oil for his motor-vessels was taken aboard in Great Britain where the cost is higher, owing to such supplies having to be imported in tankers, but that his price for coal is that of British coal bunkered in England. We believe that the figures would be changed if the fuel-oil for the motorship was taken aboard abroad, and that he had taken into consideration at least half of the coal-burning ships' bunkers must be secured from the foreign ports where the cost is much higher. Because, their vessels are in service between Great Britain, Continental Europe and South America, as well as between North and South America, they consequently cannot carry coal for a round voyage.

The advantage of the motorship is the taking of fuel-oil at the port where it is the cheapest, but with a coal-burning vessel only a limited amount of fuel can be carried, so she has to bunker wherever she happens to be when her supply runs low. Diesel engines only use one-fourth to one-fifth of the weight of fuel required by a coal-burning steamer. We suggest that Sir Owen's motorships bunker Diesel oil in New York at $1.57 per barrel ($10.49 per ton or equivalent to coal at $2.25 per ton).



The motorship "Munsterland," the second of the Hamburg-America Line's freighters equipped with submarine type Diesel engines and reduction-gears. Two similarly equipped vessels have been delivered by Blohm & Voss to Japanese shipowners

Trial-Trip of the Diesel-Electric Yacht "Alcyone"

Conversion of Schooner from Steam to More Efficient Auxiliary Power

ON March 23rd the sea trial of the three-masted schooner-yacht "Alcyone," owned by H. W. Putnam, was run, the yacht leaving the Tebo Yacht Basin of the Todd Shipyards Corp., Brooklyn, N. Y., at 10:30 A.M. with a group of engineering men and a representative of MOTORSHIP on board. This handsome yacht was built in 1908 by Geo. Lawley & Son Corp., Boston, Mass., from designs by and under the supervision of Tams, Lemoine & Crane, which firm is now known as Tams & King, who have in charge the present conversion from steam-plant to Diesel-electric power.

The trial trip occupied four hours, at the conclusion of which maneuvering tests were run. The course lay out of the harbor and along the Long Island shore; weather conditions were ideal. A noticeable feature of the trial was the almost total lack of vibration, this being remarked upon by all on board. Electric-propulsion has this very pleasing feature, that it affords such a steady torque that we believe that the propeller efficiency is increased and vibration minimized, two very worthwhile advantages of Diesel-electric drive. The positive control and the flexibility of the installation were likewise noted on the maneuvering tests when the vessel was brought to a dead-stop from a speed corresponding to 150 r.p.m. in slightly less than double her length, which is good work, as this vessel is by no means a small, light yacht. Starting and reversing tests proved satisfactory in every way.

The principal particulars of the "Alcyone" are:

Length over all	180 ft. 0 in.
Length, water-line	138 ft. 0 in.
Breadth, extreme	30 ft. 0 in.
Breadth, water-line	28 ft. 0 in.
Draught	16 ft. 0 in.
Displacement	600 tons

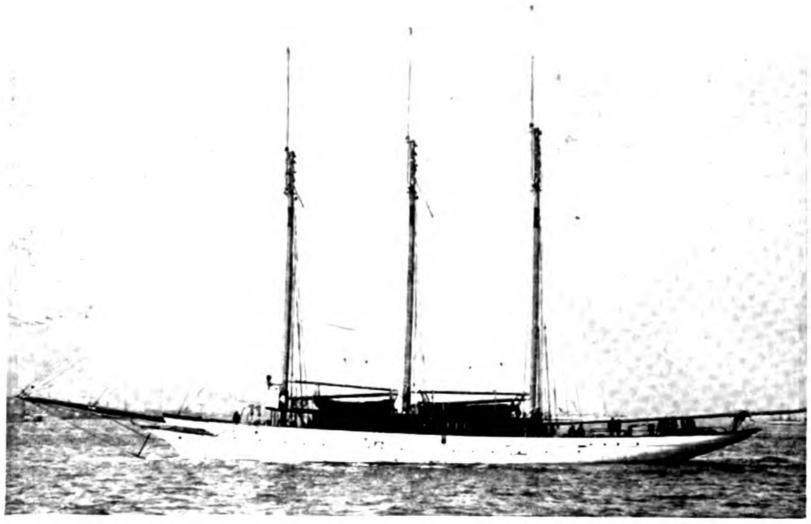
The steam-plant removed from this yacht consisted of a coal-burning boiler and a triple-expansion engine of 350 indicated horsepower driving a three-blade bronze Hyde propeller 7 ft. 4 in. dia. and 8 ft. pitch at 158 r.p.m., which drove the "Alcyone" at a speed of 10 knots. The same propeller was retained when the conversion was made and the new Diesel-electric installation turns this wheel at 170 r.p.m. and, although the displacement is greater, the speed is 11 knots. It will thus be noted that the new installation is efficient as well as economical.

Consisting of two six-cylinder 11 in. by 14 in. Winton four-cycle Diesel-engines of 225 brake h.p. each at 260 r.p.m. driving 140 K.W. Westinghouse generators, two exciters of 12 K.W. at 900 r.p.m., the new installation has many interesting features, as either is capable of handling both generators. Then there is a propelling-motor of 350 h.p. at 175 r.p.m., and two auxiliary generators driven by six-cylinder 3 in. by 4 in. Winton kerosene-engines. Each item of equipment exceeded its output, in some cases by as much as 10 per cent. at times, without trouble of any sort, and one of the outstanding features of the installation is the very slight loss of electrical-power between generators and driving-motor, this apparently being less than five per cent. Commutation was perfect at all loads and the equipment was free from heating of the motors at all times.

Perhaps the only feature which could be mentioned as being anything but perfectly satisfactory is the fact that the chain drive of the exciters to the generators does not provide sufficient flexibility, resulting in more noise than necessary from this drive. This feature could not be foreseen, but has now been corrected. The only reason it is mentioned here is in order to make constructive suggestion, that in view of the slight fore and aft movement of the exciter the chain-drive for same should be flexible in this direction as well as in the vertical plane.

Steering of the yacht is from the quarter-deck aft, the man at the wheel receiving instructions for the course by Cory course indicators controlled from the bridge at the forward end of the deck-house, which was added by the Tebo Yacht Basin as part of the work of converting this yacht to her present condition. There is no steering-wheel on the bridge. On the mast over-head is located a Strombos air signaling device. Engine-room telegraphs are provided on the bridge.

We are enabled to publish an illustration of the "Alcyone" as she appears at present with the new deck-house. Considerable interest in Diesel-electric yachts is evident at this time and we predict many more installations along the lines of that in the "Alcyone."



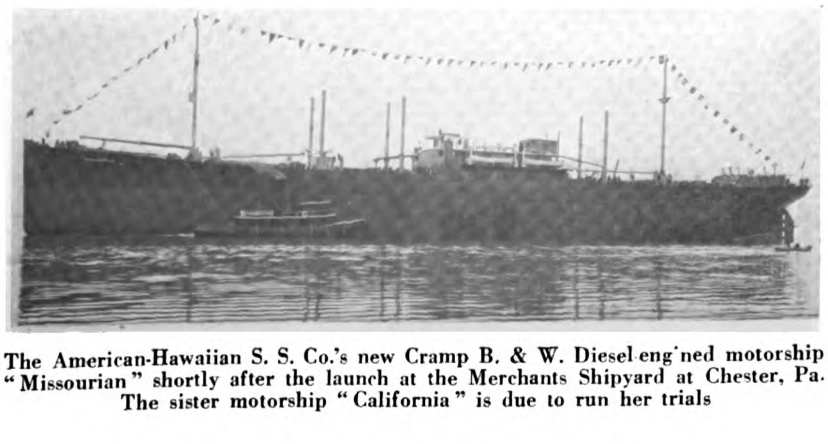
Winton-Westinghouse Diesel-electric driven motor-yacht "Alcyone," owned by H. W. Putnam

CREW OF MOTORSHIP "DINTELDIJK"

On page 282 of the April issue of "MOTORSHIP" it was stated that the Holland-American Line's new motorship "Dinteldijk" could carry a crew of about 80 men and about 12 first-class passengers. However, we understand that the total crew consists of 48 men and officers as follows:—

Captain	1
Navigation officers	4
Chief Engineer	1
Asst. Engineers	8
Oilers	9
Apprentice helmsmen	3
Sailors	16
Cooks and Stewards	6

We will mention that refrigerator space was provided for fruit-carrying as this vessel will operate under the North Pacific Coast Line (which is a subsidiary of the Royal Mail Steam Packet Co. and Holland-American Line) between Hamburg and North American ports on the West-coast, via Rotterdam and London, and via the Panama Canal. The refrigerating space holds 28,290 cu. ft. of cargo, while the cooling space is 65,900 cu ft.



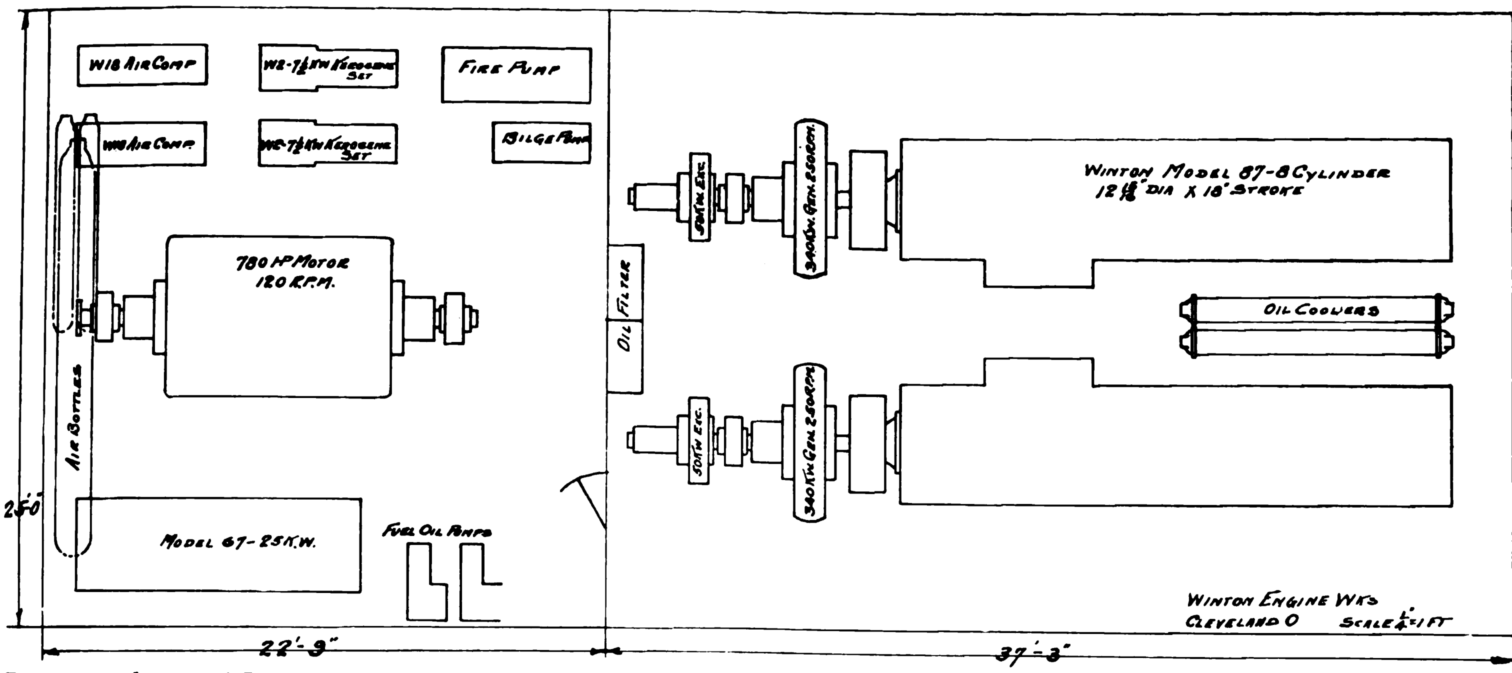
The American-Hawaiian S. S. Co.'s new Cramp B. & W. Diesel-eng'ned motorship "Missourian" shortly after the launch at the Merchants Shipyard at Chester, Pa. The sister motorship "California" is due to run her trials

ANOTHER LARGE DIESEL-DRIVEN YACHT ORDERED

A contract has just been awarded to the Tebo Yacht Basin of the Todd Shipyard Corp., Brooklyn, N. Y. by Cox & Stevens of New York for a steel motor-yacht for Merrill B. Mills, of Detroit, Mich. This new craft for Mr. Mills will be 129 ft. long, 23 ft. breadth and 6 ft. 6 in. draught. Two six-cylinder, four-cycle Winton Diesel-engines of 225 brake h.p. each will be installed. The day of the steam-yacht of the above dimensions is now over; not only economy of operation but cleanliness, safety and economy of space as well, together with splendid maneuvering ability of the oil-engine, are responsible for the decline of the steam-yacht.

BIG PROFITS FOR MOTORSHIP OPERATION

A dividend of 20 per cent. has been declared by the East Asiatic Co., who own one of the largest Diesel-driven motorship fleets in the world. During 1921 this firm realized a net profit of 26,019,945 kr. A sum of 3,176,645 kr. is being used for writing-off purposes and 2,500,000 kr. has been placed to reserve. The reserve fund now totals 62,500,000 kr., placing the company in a very strong position.



Engine-room lay-out of Diesel-electric driven vessel propelled by a 780 b.h.p. Westinghouse electric motor deriving its power from two Winton-Westinghouse 340 K.W. Diesel-electric generating sets

Motorships with Winton Engines

RECENTLY we paid a visit to the manufacturing plant at Cleveland of the Winton Engine Works, who are builders of the well-known Winton four-cycle type marine and stationary Diesel engine. Work is proceeding with pace on a number of engines which are likely to be augmented by a number of orders for Diesel-engines, which are now in the final stages of negotiation. Just prior to our arrival a number of sets had been shipped for marine purposes, and stationary engines for power in plants on land.

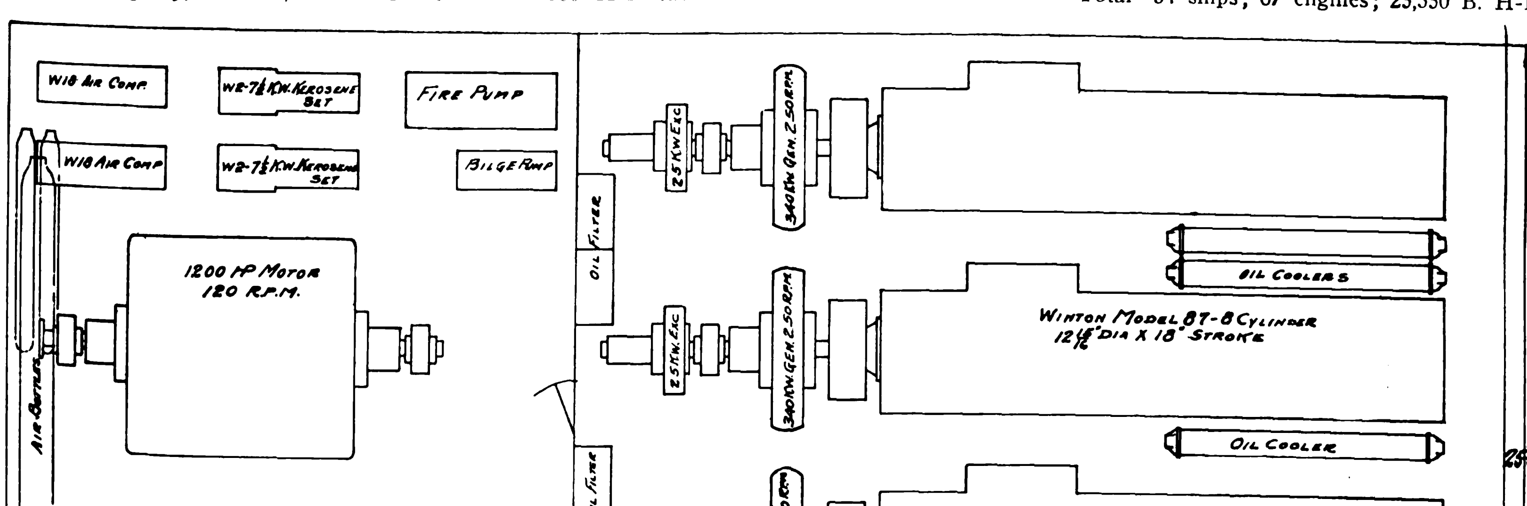
It is not generally known that there are now a total of thirty-four vessels of different classes powered with Winton Diesel engines, which include fourteen full-powered ships.

These vessels are as follows, and it will be noted they represent sixty-seven main engines aggregating 25,350 shaft h.p., in addition to the auxiliary engines.

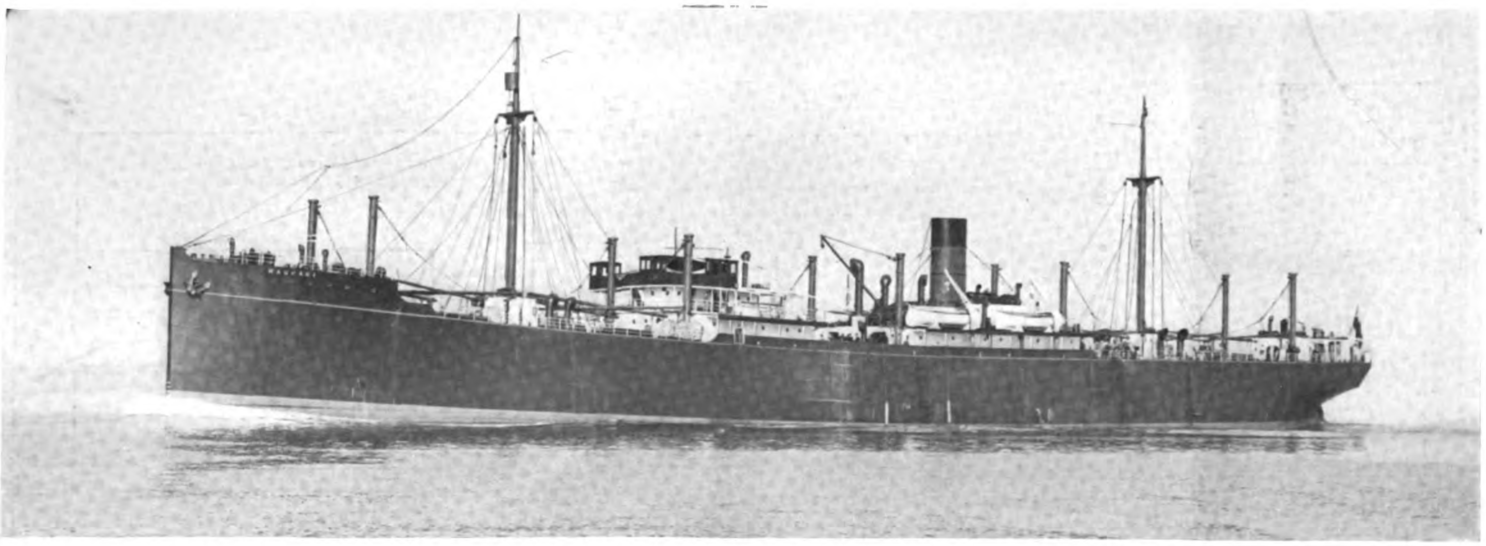
Full-Powered Cargo-Ship "Mount Hood," Gaston, Williams & Wigmore, N. Y. C., 2 500 H-P each.
Full-Powered Cargo-Ship "Mazatlan," Long Beach Shipbuilding Co., 2 350 H-P each.
Full-Powered Cargo-Ship "Mount Baker," Frank B. Peterson Co., San Francisco, Cal., 2 500 H-P each.
Full-Powered Cargo-Ship "Trolltind," Anglo-Norwegian Shipping Agency, N. Y. C., 2 500 H-P each.

Thirty-four Marine Installations with This Cleveland-built Diesel-Engine Including 14 Full-Powered Commercial Ships

Full-Powered Cargo-Ship "Wm. Donovan," Donovan Lumber Co., Aberdeen, Wash., 2 500 H-P each.
Full-Powered Cargo-Ship "Semmeltind," American Motorship Co., Christiania, Norway, 2 500 H-P each.
Full-Powered Cargo-Ship "James Timpson," I. T. Williams & Sons, New York City, 2 500 H-P each.
Auxiliary-Schooner "Chas. Gawthrop," American Car & Foundry Co., Berwick, Pa., 2 (Reduction-Gear).
Auxiliary-Schooner "Sherewog," R. Lawrence Smith, New York City, 2 350 H-P each.
Auxiliary-Schooner "Adrien Badin," Compagnie France-Atlantique, 2 350 H-P each.
Auxiliary-Schooner "Erris," Bowman Bros., Portland, Ore., 2 350 H-P each.
Auxiliary-Schooner "Pechiney," Soc. de Trafiliere, Havre, France, 2 350 H-P each.
Auxiliary-Schooner "Esperanca," A. O. Anderson & Co., New York City, 2 350 H-P each.
Yacht "Hussar III," E. F. Hutton, 2 300 H-P each.
Yacht "Elfay," Russel A. Alger, Jr., 1 125 H-P (Elect-Drive).
Yacht "Guinevere," Edgar Palmer, New York City, 2 350 H-P (Elec. Drive).
Yacht "Nourmahal," Vincent Astor, New York City, 2 350 H-P each.
Yacht "Marold II," C. Harold Wills, 2 350 H-P each.
Yacht "Whitemarsh," E. W. Marland, 1 125 H-P each.
Yacht "Dolphin," Unknown, 2 500 H-P each.
Yacht "Cynthia," M. B. Mills, 2 225 H-P each.
Yacht "Valejo," G. Allan Hancock, Los Angeles, Cal., 2 150 H-P each (Elec. Drive).
Yacht "Alcyone," H. W. Putnam, 2 225 H-P each (Elec. Drive).
Yacht (Unnamed), E. B. Dane, 2,250 H-P each.
Yacht "Sabalo," Vanlear Black, 2 225 H-P each.
Yacht "Coleen," Samuel A. Salvage, 2 150 H-P each.
Ferry-Boat "Poughkeepsie," Highland-Poughkeepsie Ferry Co., Poughkeepsie, N. Y., 2 250 H-P each (Elec. Drive).
Tow-Boat "Abitibi," Abitibi Power & Paper Co., Ltd., 1 350 H-P each.
Full-Powered River Vessel "Col. Frederick G. Hodgson," U. S. Government, 2 500 H-P each.
Full-Powered River Vessel "Gen. M. I. Ludington," U. S. Government, 2 500 H-P each.
Full-Powered River Vessel "Gen. Rufus Ingalls," U. S. Government, 2 500 H-P each.
Full-Powered River Vessel "Gen. D. H. Rucker," U. S. Government, 2 500 H-P each.
Full-Powered River Vessel "Gen. Geo. Gibson," U. S. Government, 2 500 H-P. each.
Full-Powered River Vessel "Gen. Morgan Lewis," U. S. Government, 2 500 H-P each.
Full-Powered River Vessel "Gen. John Wilkins," U. S. Government, 2 500 H-P. each.
Total—34 ships; 67 engines; 25,350 B. H-P.



Engine-room lay-out of Diesel-electric driven vessel propelled by a 1,200 b.h.p. Westinghouse electric motor deriving power from three Winton-Westinghouse 340 K.W. Diesel-electric generating sets



Union Steamship Co.'s new cargo motorship "Hauraki," propelled by twin h.p. North British Diesel engines

Trials of New Zealand Motorship "Hauraki"

Good Performance of Union Steamship Co.'s North British Diesel-Engined Freighter. A Speed of Over 13 Knots Attained

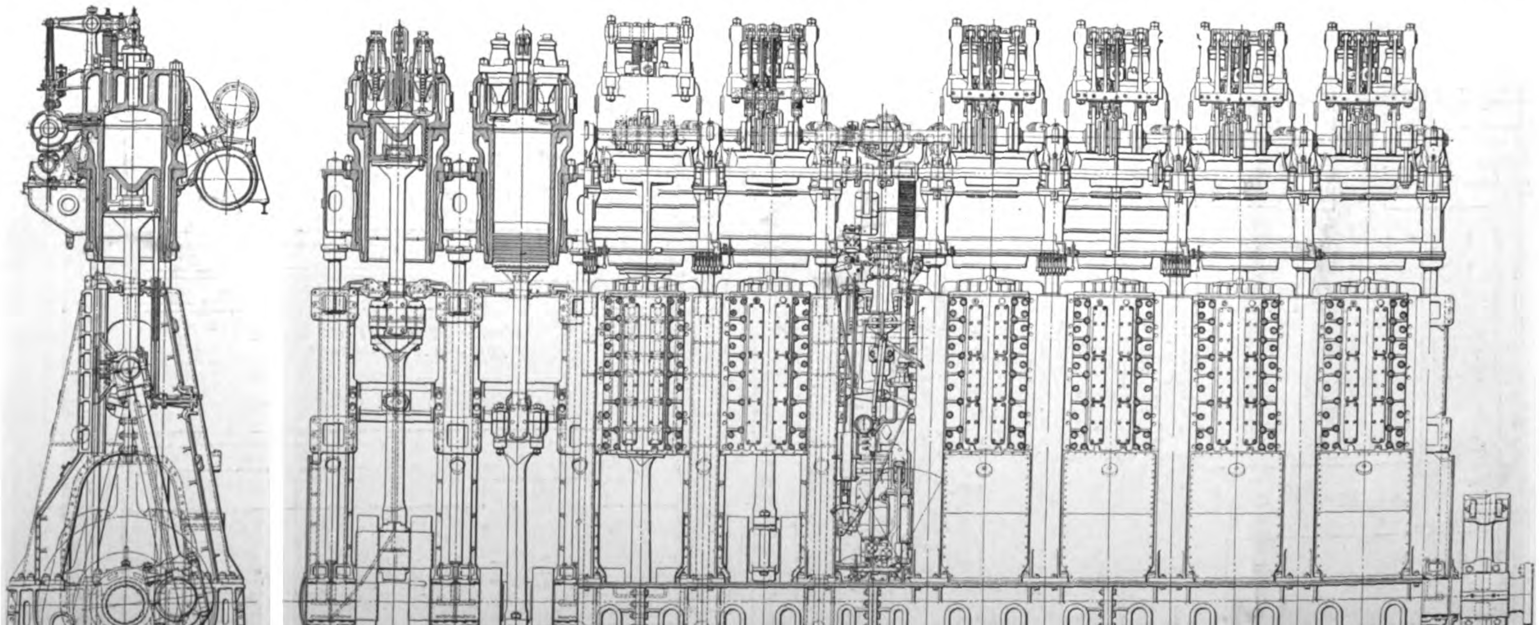
VERY few modern merchant-ships are put through so severe an acceptance test as was the Union Steamship Company of New Zealand's new 10,600 tons deadweight motorship *Hauraki,* which left Scotland for San Francisco on her maiden voyage on March 11th. And, exceedingly few vessels would come through such a trial with colors flying, particularly if fitted with the second set of propelling-engines of a particular make and design. The *Hauraki* first ran a speed trial of six runs over the measured mile and then a deep-sea trial of three days' duration as well as maneuvring tests.

On her deep-sea tests this big freighter covered a distance of 881 nautical-miles at an average speed of 12.69 knots on a fuel-consumption of 14.92 tons of fuel-oil per 24 hours, or 0.297 lb. per. i.h.p. hour, for all purposes. This consumption included one Diesel-electric auxiliary generating-set of 200 b.h.p. Together with the twin main propelling-engines the total power output averaged 4,619 i.h.p. She was running light, her displacement being 8,550 tons. But fully loaded her expected speed is 12 to 12½ knots on 14 tons of fuel per day.

On her speed test of six runs over the measured mile the average speed was 13.2 knots with both Diesel engines averaging 97 r.p.m. and developing 4,632 i.h.p. at 100.26 r.p.m. with a mean indicated-pressure of 88.12 lbs.

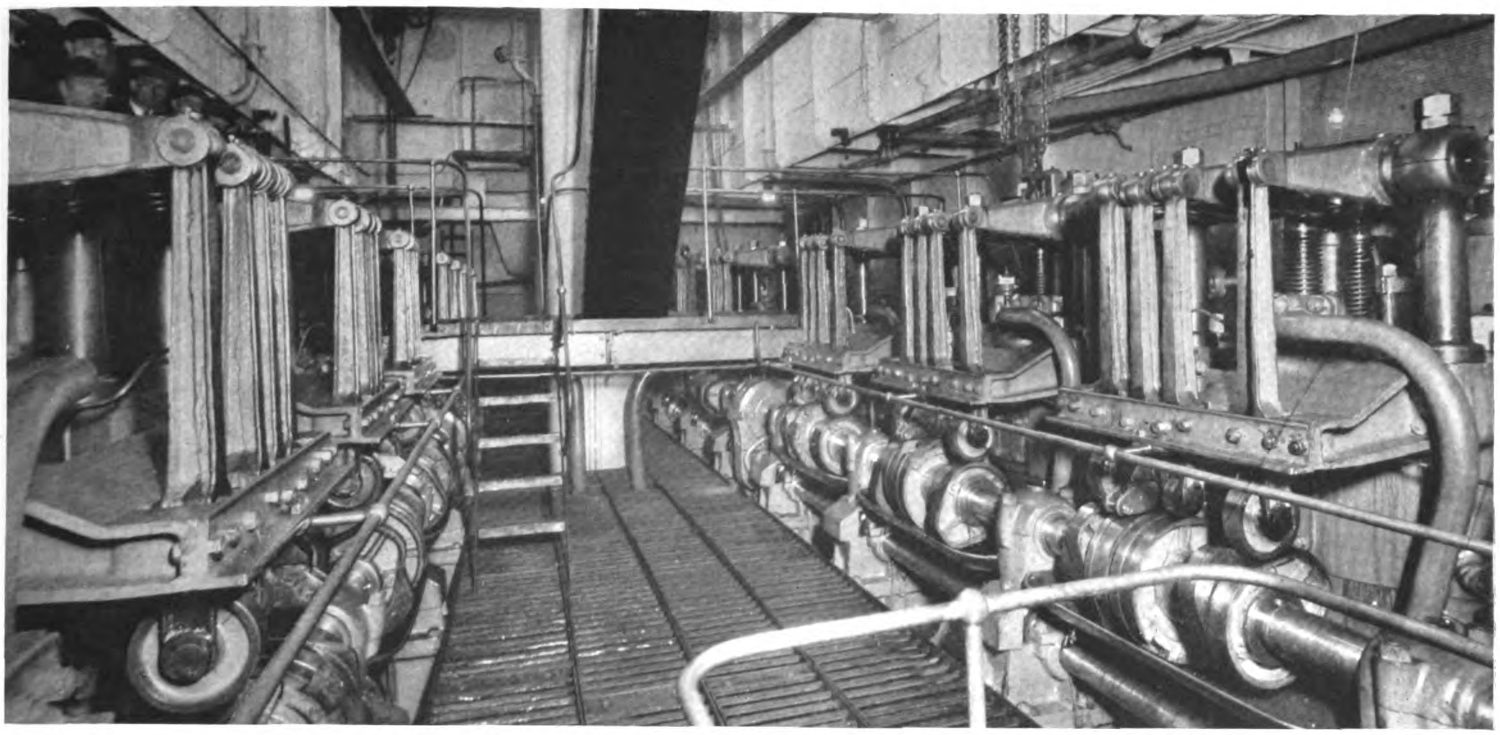
For fuel an Anglo-Persian fuel-oil of 0.889 gravity was used, and it may here be noted that there is a strong tendency among British motorship owners to use this oil instead of Mexican, Texas or American fuels, even if the ship is calling at American ports en route, or passing through the Panama Canal. Probably this is a matter of prices, or else endeavors to be independent of American oil companies. Leading American oil-companies desire to take Diesel-oil off the market or increase its price to a prohibitive figure, while apparently the Royal Dutch-Shell companies intend to make it available at any port in the World, and market it at the same price as boiler-oil in some distant ports. But this is a separate story.

Plans, drawings and a complete description of the *Hauraki* were published in MOTORSHIP of November last, but through a misunderstanding the shaft horsepower of her main engines was given as the indicated power. Although the vessel is a freighter she has accommodation for eight first-class passengers. Both the ship and her engines were built under the supervision of Wm. T. Tucker, M.I.E.S.; M.I. Mar. E., who expressed himself to us as being highly pleased with the performance of the machinery and vessel. Mr. Tucker for a considerable time has been a keen reader of MOTORSHIP, as also has been the Managing-Director of the owning company in New Zealand as well as their London office, so we should not be surprised of the many benefits of Diesel-drive outlined in these pages have had quite considerable influence upon the executives of the company in inducing them to order this noteworthy vessel. Incidently the parent company, namely the British India Steam Navigation Company who also have become owners of motorships, have for a long while been subscribers to MOTORSHIP. We think they too may have been influenced by what they have read in this magazine, as have many American shipowners. No other class of vessel can circumnavigate the world without taking fuel enroute and yet carry such a large general cargo in proportion as the *Hauraki.* Had this freighter been coal-fired, she would consume 66 tons per day and

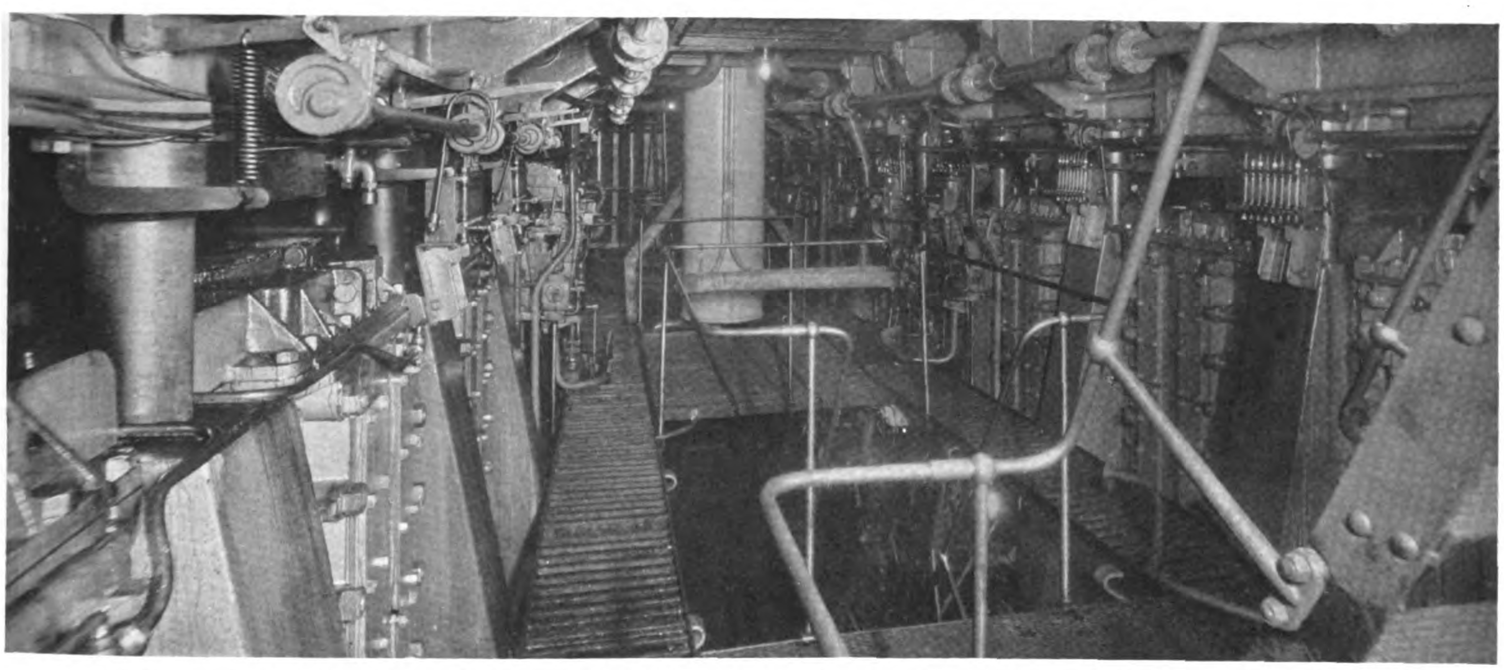


General arrangement drawing of the motorship "Hauraki's" North British Diesel engines. The twin three-stage air-compressor on extension of crank-shaft at forward end not shown

Engine-room of the New Motorship "Hauraki"



Upper platform showing valve operating mechanism



Middle platform showing cylinder, lubricators, entablature and upper parts of engine frames

Main floor showing control gear for maneuvering engine

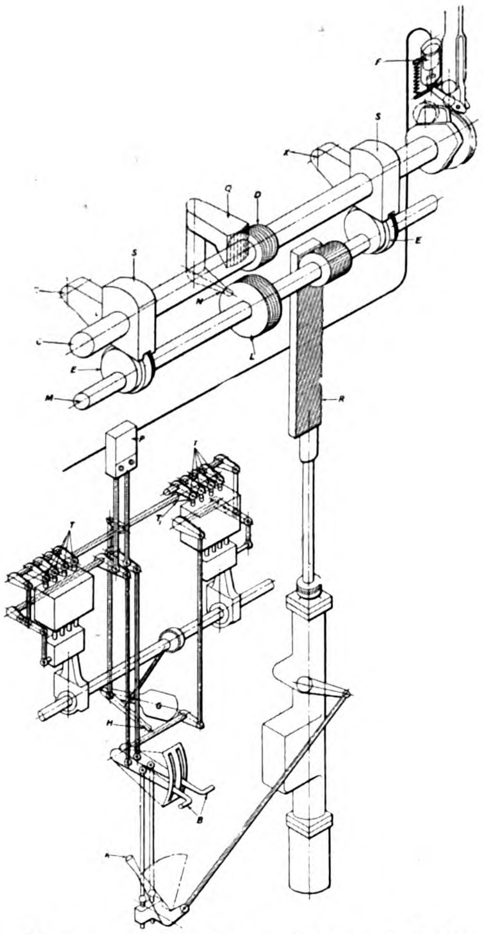


Diagram of reversing mechanism of North British Diesel engines of the "Hauraki"

average only 11½ knots; whereas her fuel-consumption with Diesel drive will not exceed 16 tons per day, while her average loaded speed will be 12½ knots. Were she fitted with oil-fired steam machinery her fuel consumption would have been 45 tons per day. The fuel is carried in all double bottoms and peak and if necessary the deep-tank can be loaded with fuel-oil totaling about 2,950 tons in all. But it is doubtful if fuel-oil will ever be carried in her deep-tank because less than the above quantity will enable her to circumnavigate the world. Therefore, we presume that her deep-tank will be used for cargo only. On a 6,999 nautical-mile voyage, taking in fuel at each terminal point, the *Hauraki* will carry 1,000 tons more weight cargo than a similar vessel with steam-engines coal-fired, and take one day less to cover the distance.

The main dimensions of the *Hauraki* we will repeat, and are as follows:

Deadweight	10,600 tons
Power of main engines	4,500 i.h.p.
Power of auxiliary engines	600 b.h.p.
Speed	12½ knots
Daily fuel-consumption	14 to 15 tons
Length (BP)	450 ft.
Breadth	58 ft.
Depth	34 ft.
Loaded draft	27 ft. 6 in.
Passenger-accommodation	8 first class

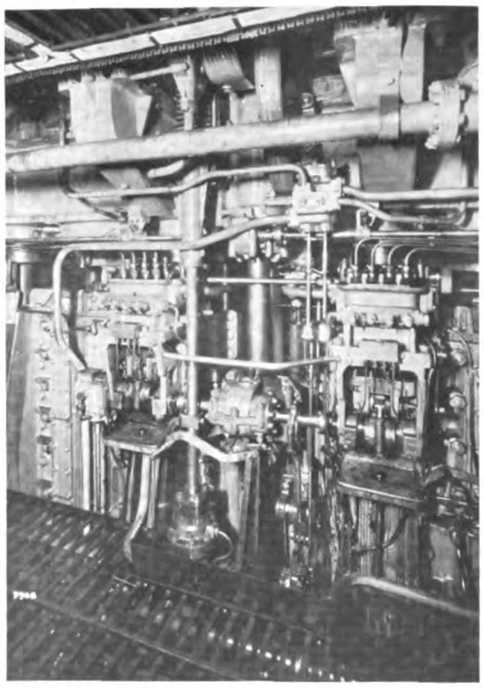
She was built by Denny Bros. of Dumbarton, Scotland, and Diesel-engined by the North British Diesel Engine Co. of Glasgow. Her main engines are similar to those installed in the passenger liner *Domala* of the British India Line, with the exception that twin 3 stage air-compressors are driven off an extension of the crankshaft at the forward end of each engine instead of by auxiliary Diesel engines. This reduces the shaft horsepower somewhat. Two engines are installed, each six-cylinder sets of the four-cycle type, 26½ in. bore by 47 in. stroke, having an output of 2,250 I.H.P. each at 96 R.P.M. There are three auxiliary Diesel-engines, two of which are arranged at the star-board side and one on the port-side of the engine, all coupled to electric-generators at 220 volt. They are four-cylinder sets 11½ in. bore by 14½ in. stroke each developing 200 b.h.p. at 375 R.P.M.

An unusual feature of the engine construction is that the main-engine pistons are of cast-steel with ordinary cast-iron piston-rings. The piston can be withdrawn from the top or below each cylinder.

Were a Kingsbury or Michell thrust-bearing fitted in place of the horseshoe thrust considerable space could be saved. As it is the engines occupy a space 53 ft. 3 ins. long by the width of the ship, the thrust recess being 13 ft. 6 in. long additional. Engine-room plans were given with the previous article in MOTORSHIP. We note that a DeLaval oil separator is installed in the engine-room as well as a 1½ tons settling-tank for handling the used lubricating oil. The lubricators on the main engines were made by the Vacuum Oil Co. There are five sets on each engine.

The mean draft on the trial was 16 ft. 2 in., the displacement being 8,850 tons. The electric load at sea for the steering-gear, lighting, pumps etc. is 300 amps, but when the ship is entering or leaving port the load is 850 amps. At sea the electric load will take less than half-a-ton of fuel per day for all auxiliary purposes. The blast pressure on the main engines is 1,000 lbs., and starting-air at 300 lbs. The exhaust-gases have a temperature of about 300 degrees centigrade. Automatic control of the main engines is by Aspinall governors, which come into action at 100 r.p.m.

Among the illustrations accompanying this article is a diagram of the reversing mechanism.

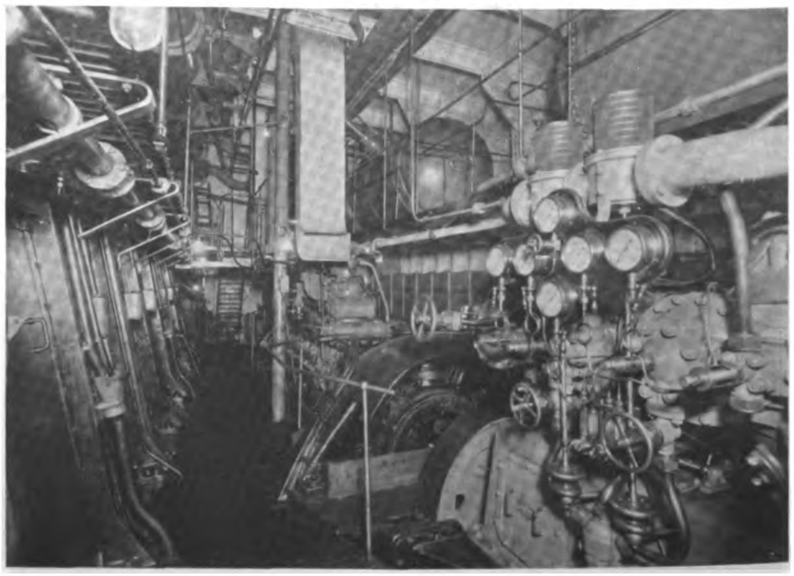


Maneuvring apparatus on one of the "Hauraki's" engines

Reference to the same will show that The bearings S for camshaft C are pivoted at X, are therefore free to move in a vertical direction. This movement is controlled by the maneuvring-shaft M, which is carried directly under the camshaft C and on which the eccentrics E are mounted beneath each bearing S.

When the engine is reversed from ahead to astern, lever A is moved to other end of quadrant, the rack R moves upward, and the maneuvring shaft M rotates, this causes the camshaft C to drop. After one-third revolution of the shaft M the cams have dropped clear of rollers and scroll L moves the camshaft in an aft direction through the arm N, toothed quadrant Q, and grooved drum D by an amount sufficient to bring the astern cams under rollers. The last part of the revolution of the shaft M raises the camshaft into its original position, and the engine is ready to start astern. To start-up the engine, the master air-valve is opened, lever A set in position required, and control lever B brought down to bottom of quadrant. This movement depress fuel pump tappets T, and holds the suction-valves open for whole stroke of pump, so that no fuel passes the delivery-valves. It also opens the piston-valves in chest P; these valves admit air to the starting-valve gear actuating cylinders F, thus causing the starting-valve rollers to come in contact with the cams and air is admitted to all cylinders.

Auxiliary Diesel-electric generating sets in the engine-room of the "Hauraki"



Electrically-driven auxiliary air-compressor in the engine-room of the "Hauraki"

When the engine has speeded up on air, the levers B are thrown-up towards the top of the quadrant past no-fuel position. This movement lifts the fuel-pump tappets off the suction-valves for part of the pump stroke and allows oil to be admitted to the cylinders, and also cuts-off air from the starting-valve gear actuating cylinders F from the engine cylinders, and lifts the rollers off the starting cams. The engine is now completely controlled by levers B, which control the suction-valves of the fuel-pumps, and thus regulates the amount of oil pumped to the cylinders.

The governor G, which is driven off the fuel- pump shaft, is set so that when the engine speed becomes excessive the lever H is engaged and carried upwards. This brings into operation a secondary set of tappets T_1, which depress the fuel-pump suction-valves and thus cut-off the supply of oil to the engine cylinders. It should be noticed that lever A and levers B are interlocked so that first control-levers B cannot be moved when A is in neutral position. The second lever A cannot be put from ahead to astern or vice versa if the levers B are in any but no fuel position.

During the trials there was a high wind, and as the vessel was very light the results may be considered very satisfactory, especially as the machinery worked throughout with the utmost smoothness and with freedom from vibration. Previous to the vessel leaving Glasgow Harbor the only tests to which the machinery had been subjected were the dock trials. She went down the river under her own power, attended by tugs, and on arriving at the Tail of the Bank she cruised about for half an hour before coming to anchor. We may shortly give the latest plans of this ship.

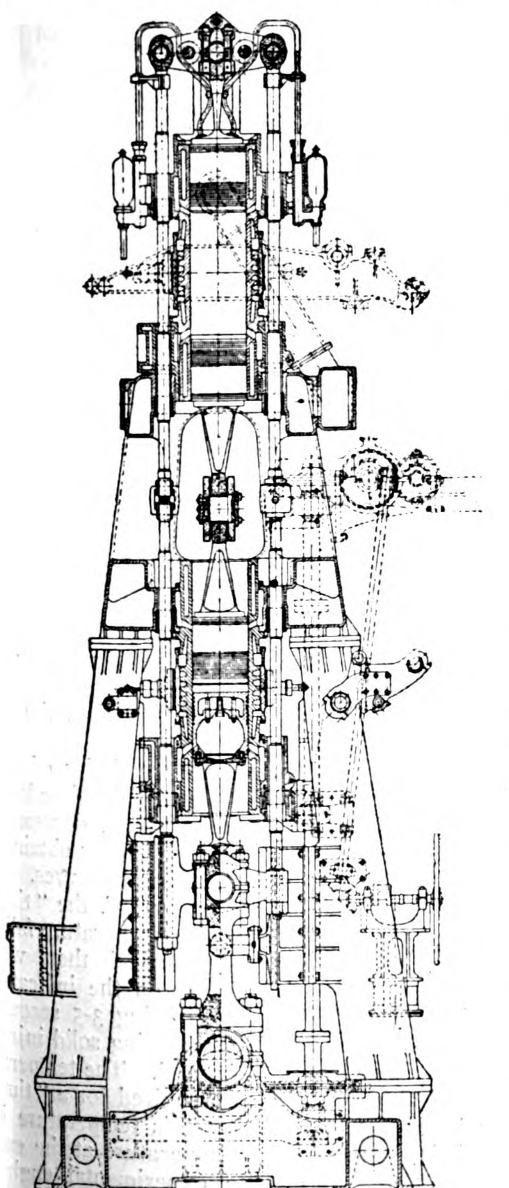
FIFTIETH ANNIVERSARY OF THE "WESER" COMPANY—AN ECHO OF AN UNUSUAL DIESEL-ENGINE

From Germany we have received a brochure dealing with the Fiftieth Anniversary of the Actien-gesellschaft "Weser," a big shipbuilding company at Bremen. It may be remembered that in the early days of the motorship development this company started the construction of marine Diesel-engines under the Junkers opposed piston system, but instead of following the design that has been adopted by Doxfords of England, Frerichs of Germany and the Sun Shipbuilding Co. of America, their engine had a set of super-imposed pistons or four pistons per crank, as will be seen by the sectional drawing which we give herewith.

This unusual design of Diesel-engine was of 1,000 brake h.p. with three double or tandem cylinders of 400 mm. diameter and 400 mm. stroke, the revolutions per minute being 120. In view of the lack of previous data on such a design, the weight and size of this engine was somewhat greater than might now be expected, the height from the bottom of the bedplate to top of engine being 27 feet 6 inches, the length over end bearings being 23 feet 6 inches and the width 9 feet. The cylinders were supported in the usual manner by cast-iron columns bolted to the bed-plate. Four double-acting scavenge-pumps were driven from the central piston-rod off the fore and aft cylinders by means of beam levers, these pumps being of 700 mm. diameter and 400 mm. stroke, giving about double the volume of a working-cylinder. Also by beam-levers a four-stroke air-compressor was driven from the central working cylinder, while the auxiliary pumps were driven off the crankshaft.

The two central-pistons were coupled together, and by means of a beam-lever two long coupling-rods and two connecting-rods were driven onto the crankshaft, one on each side of the central-crank, which was driven from the bottom-piston and also from the top-piston by means of two long levers and an upper beam-lever. Each cylinder contained two fuel-valves, one starting-valve and one safety-valve. Piston-cooling was accomplished by two pipes leading from the heads, these pipes bent down or up as the case might be and moving telescopically in cylindrical chambers, connected with water-reservoirs, glands being provided to prevent leakage.

This anniversary brochure—which contains an illustration of this engine in the shop—is handsomely printed, attractively illustrated, bound in vellum and reflects the high standing and prominence of the Weser firm in Germany. We look forward to seeing more recent developments of their Diesel engines.



The Weser-Junkers opposed piston engine with super-imposed pistons. A 1,000 h.p. engine of this design was completed for a freighter in 1914

One of the big New York State canal motor-vessels of the Interwaterways Line. She is propelled by two 120 b.h.p. oil-engines, built by the Pacific Diesel Engine Co.

MOTOR ORE-CARRIER "LAPONIA" RUNS TRIALS

Trials of the new ore-carrying motorship "Laponia," built and engined by the Götaverken at their yard in Göteborg, Sweden, were run on the 18th of March. She is a sister ship to the "Strassa," another of the series of motor ore-carriers which the great Swedish iron - ore - concerns Grangesberg - Oxelosund placed with Götaverken. All are built to the highest class of British Lloyd, and are constructed to sustain the stresses of the particularly heavy loads.

The dimensions of the M. S. "Laponia" are exactly the same as the M. S. "Strassa," which has already been described in Motorship. Length over all 399'3", moulded breadth 53'5" moulded depth to shelterdeck 34'3¼". The dead-weight is also the same, viz. 8,200 tons. The main machinery consists of two of the Götaverken-Diesel-engines of 2,600 I.H.P. The trial trip was very successfully completed and the ship is now going to Narvik in Norway, where she will immediately start in the ore-service. Narvik is the principal shipping port for the Swedish iron-ore trade.

The "Laponia," second of the Grangesburg Oxelosund fleet of Gotaverken built, Diesel-driven ore-carriers

Injection and Combustion of Fuel-Oil

Experiments with Solid-Injection and Air-Blast in Marine Diesel Engines

By ENGINEER-COMMANDER C. J. HAWKES

Part IX—Conclusion

(*Continued from page 195, March issue*)

THE following experiment was carried out in order to ascertain the variation of the temperature of the air in the cylinder. The end cover E (Fig. 24), which corresponds to the piston of an oil-engine, was removed and replaced by a thick sheet of asbestos millboard so that the position of the thermocouple could be readily varied. The air in the cylinder at atmospheric pressure was then heated up until a constant maximum temperature was reached. The thermocouple was then placed at various points on the centre line of the cylinder, and also in contact with the sides of the cylinder. Three sets of readings were taken and the mean temperatures obtained for each position of the thermocouple, for a maximum temperature of about 350° C., are shown in Fig. 25.

From the curve showing the temperature gradient on the centre line of the cylinder it will be seen that the maximum temperature is at a point about three inches from the air-cooled cover, and for a distance of one inch on either side of this point the temperature variation is not more than 5° C. The greatest

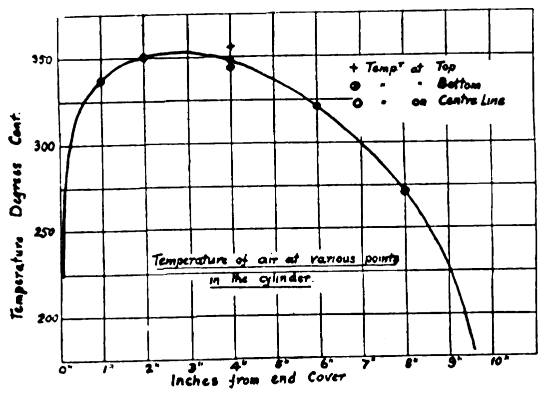


FIG. 25.

variation of temperature of the cylinder-wall, as recorded by the couple placed close up to the wall, occurred at the top and bottom of the cylinder—the top being somewhat hotter than the air on the centre line. At a distance of four inches from the air-cooled cover the temperature of the air contact with the cylinder-top was about 10° C above that of the air on the centre line. This was the maximum temperature recorded. By making each ignition experiment on a very slowly falling temperature it is probable that such differences would be lessened, if not entirely eliminated. During the experiments the couple is placed at a distance of three inches from the end cover E, Fig. 24, and it is considered that the results obtained are accurate within +5° C.

In a Diesel engine the temperature at the end of the compression when starting from cold must be sufficient to ignite spontaneously the injected fuel-oil in the time available. The initial temperature of the working fluid at the commencement of compression will be appreciably higher when the engine has been firing than when it starts from the cold condition. The cold condition is consequently the determining factor in regard to the compression ratio required for a given fuel-oil, and in these experiments, therefore, the starting condition only has been considered. Assuming equation $pvn\ 1^n = constant$ between the initial and final compression pressures, the average value of n obtained from a number of compression cards taken from a four-stroke engine was 1.27, with compression ratios of 11:1 and 12.1:1. This engine was started with compressed-air from the cold condition, and when the speed had reached that usually necessary to insure the ignition of the injected fuel the starting air was shut off and the compression-card taken.

Curves showing the temperature and pressure at the end of compression for various compression ratios are shown in Fig. 26. These curves are based on the following assumptions:—

(1) That the temperature of the air in the cylinder at the commencement of compression, when the engine is cold, is 10° C. (50° F.).

(2) That the volumetric efficiency when the engine is running on starting air is 100 per cent.

(3) That the index n of the compression curve is 1.27.

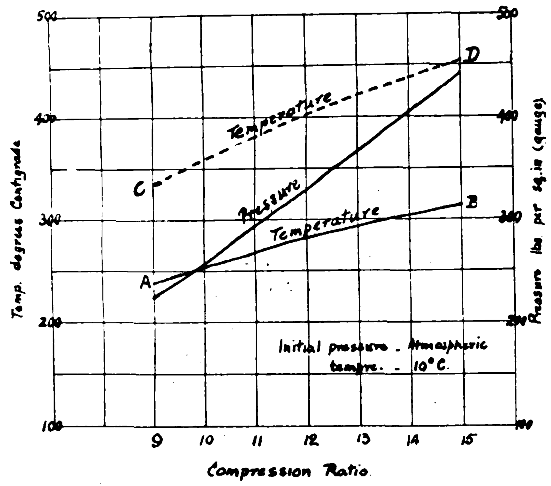


FIG. 26.

A number of combination diagrams were taken when starting the four-cycle experimental engine referred to above from the cold condition, using shale fuel-oil with a compression ratio of 11:1, and it was found that to ensure an easy start the average time which elapsed from the point of opening of the fuel valve to the point at which the pressure began to rise above the "no-fuel compression-expansion" curve had to be of the order of 0.04 second. In the experiments which were carried out in the ignition-temperature apparatus, therefore, it was assumed that the ignition of the fuel-oil, as indicated by the rise in pressure, had to take place in 0.04 second from the instant the fuel-valve commenced to lift.

In the preliminary experiments with the ignition apparatus a temperature was selected for an experiment, and the cylinder was filled with air at a pressure slightly higher than the pressure corresponding to the temperature obtained from Fig. 26 (full lines). The air was then heated-up until the reading of the temperature-indicator was steady at the desired temperature. As soon as the pressure of the air in the cylinder had fallen to the pressure corresponding to the temperature the indicator drum was set in motion and the weight W, Fig. 24, allowed to fall, thus injecting a small quantity of fuel-oil into the cylinder. The pressure in the fuel-oil system had, of course, to be previously pumped-up to that required for the experiment. The time which elapsed between the instant of opening the fuel-valve and the instant the rise of pressure occurred, due to the combustion of the oil, was measured. If this differed from the time interval allowed, further experiments were made at different temperatures and pressures until the correct time interval was recorded. By this means what has been termed the practical ignition temperature was obtained for the particular oil with the assumptions made.

Temperature of air before ignition ...	349° C.
Rise of air temperature after ignition ...	5° C.
Air pressure before ignition	200 lbs. to square inch.
Rise of pressure after ignition	170 lbs. to square inch.
Fuel oil pressure	3,000 lbs. to square inch.

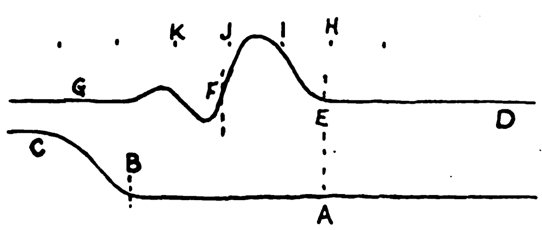


FIG. 27.

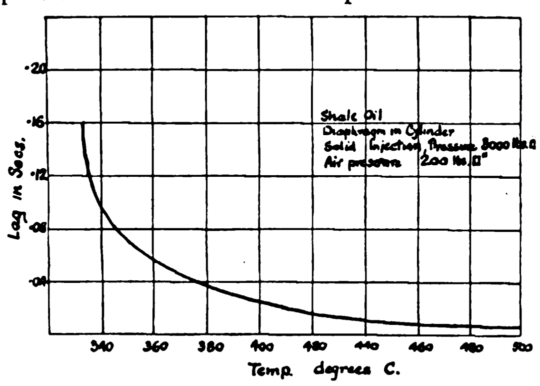


FIG. 28.

A portion of a diagram obtained from the apparatus, when using solid (airless) injection, is shown in Fig. 27. The oil used was shale fuel-oil having a s.g. of 0.86 at 60° F. The curve A B C shows the pressure in the cylinder. The pressure at A is 200 pounds per square inch, and the pressure at C, after the ignition of the oil, is 370 pounds, per square inch—a rise of 170 pounds per square inch with the quantity of fuel-oil injected. The curve D, E, F, G shows the fuel-valve lift, magnified in the original diagram about six times. The fuel valve opened at E and closed at F. The point H, I, J, K, etc., were marked on the diagram by the timing device, and the average time interval is 0.019 second, *i. e.*, the indicator paper traveled one inch in 0.052 second. The pressure in the fuel-system was kept constant at 3,000 pounds per square inch.

It will be seen from this diagram that the indicator begins to show a rise of pressure in the cylinder at the point B, and the distance A, B, corresponds to a time interval of 0.068 second, *i.e.*, the ttime which elapsed between the commencement of opening of the fuel valve and the indication of rise of pressure in the cylinder was 0.068 second. The temperature of the air in the cylinder when the oil was injected was 349° C.

As the temperature in the cylinder of the ignition apparatus is increased the "time lag," represented by A, B, in Fig. 27, decreases. Fig. 28 shows the "time lag" so far obtained with shale fuel at various temperatures. It will be seen that at about 350° C. the "time lag" increases rapidly as the temperature falls. The lowest temperature at which there was any sign of ignition shown on the indicator card was 260° C., the lag being 3-5 second.

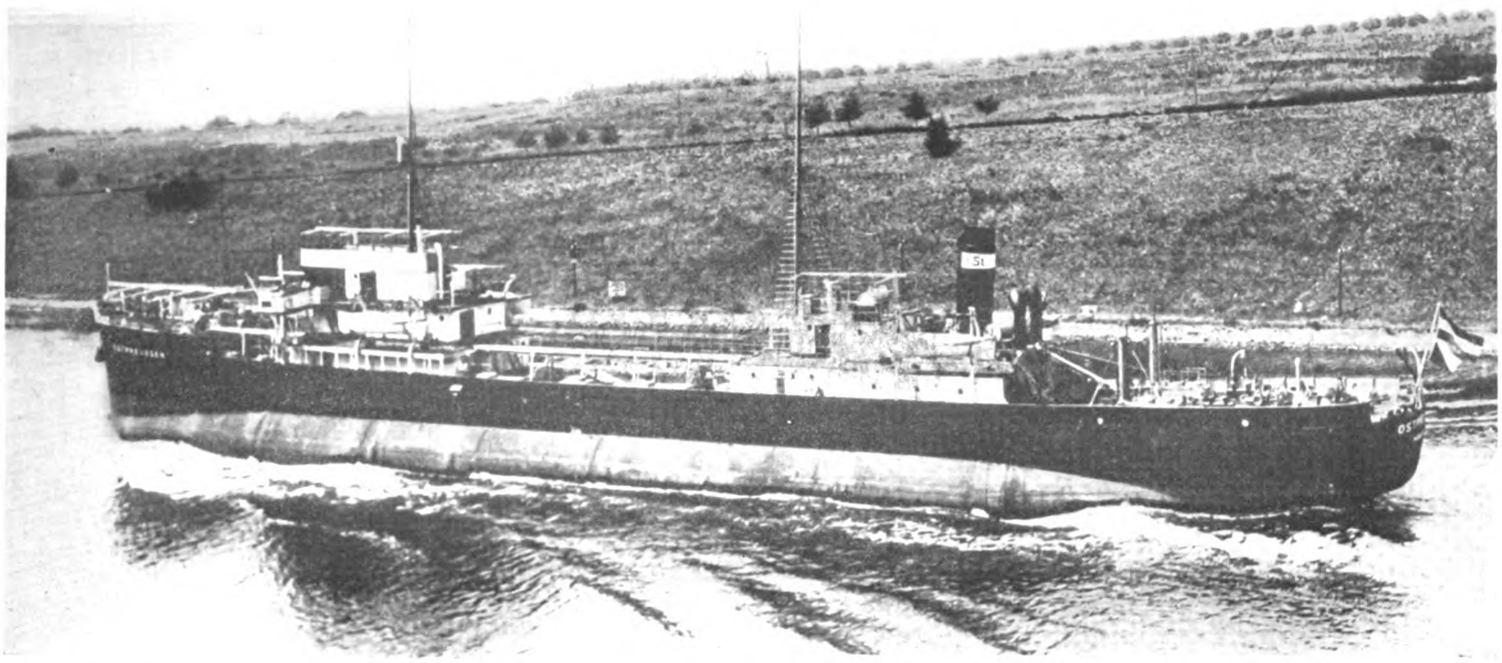
With shale fuel-oil, when using solid injection the cylinder was 0.068 second. The temperature of about 380° C. is required for a "time lag" of 0.04 second, but this temperature is much higher than the temperature at the end of compression of the experimental engine (Fig. 26) with a compression ratio of 11:1—and the engine will start readily from cold with shale fuel-oil using this compression ratio.

In a Deisel engine, owing to the cooling effect of the piston, cover, and liner, the temperature of the air near the walls at the end of compression is less than the temperature of the air in the centre of the combustion space, *i.e.*, there is a hot zone in the centre of the combustion space, and it is through this hot zone that the fuel is sprayed. The temperature at the end of compression from Fig. 26, which is derived from the formula $pv^{1.27} = constant$, is a measure of the *mean* temperature of the combustion space—but it is the maximum temperature of the combustion space, *i.e.*, the temperature of the hot zone, which causes the fuel-oil spray to ignite. It would appear, therefore, that the temperature obtained from the ignition apparatus is more a measure of the maximum temperature of the hot zone in the combustion space of the engine, and consequently the temperature-compression ratio curve A, B in Fig. 26 cannot be used to ascertain the compression ratio to be employed to ensure an easy start from cold with a given fuel-oil. It is probable that the curve C, D, shown dotted in Fig. 26, would be more nearly correct for this purpose, but this question is being further investigated. The maximum temperature of the hot zone in an engine is, of course, dependent on the shape of the combustion chamber.

Although a large number of tests have been made with shale fuel-oil, to ensure the satisfactory working of the apparatus, there has been no time to carry out many tests with oils of other brands. So far as the experiments have gone with shale fuel-oil it has been found that for the same quantity of fuel-oil injected an increase in the initial temperature of the air in the cylinder resulted up to a certain point in an increase in the maximum pressure rise and in a reduction in the "time lag." Above this point an increase in the initial temperature reduced the "time lag," but the maximum pressure-rise due to the combustion of the fuel-oil began to decrease. This would appear to indicate that combustion was delayed at the higher temperatures, and it confirms the results obtained with the four-stroke engine during the tests with the hot plates, referred to previously. A few experiments were made with shale fuel-oil when using air injection, and it was found that it was necessary to have a temperature about 40° C. higher than the temperature necessary with solid injection, for the same "time lag."

The experimental work which has been outlined in this Paper is concerned principally with the high-speed engine, but the injection of fuel-oil is equally important in the case of the slow-speed engine, and several of the questions dealt with are common to both types. In some cases, particularly in the case of the ignition experiments, the results given are not as complete as one would wish, as the experiments are proceeding, but it is hoped that what has been given will prove of interest to the members of the Institution, and that the reasons advanced for certain occurrences will stimulate discussion.

In conclusion the Author desires to express his thanks to the Admiralty for permission to give publicity to these experiments, and to the staff of the Laboratory, especially to Mr. Newman, Chief Designer, and Mr. Aitken, Chief Testing Engineer, for their valuable assistance in connection with the experimental work. The Author also wishes to acknowledge the valuable assistance rendered by Dr. O. F. Hudson in connection with the ignition experiments. (FINIS)



Hugo Stinnes' Diesel motorship "Ostpreussen" converted from a submarine to a freighter. She recently completed a round trip from Hamburg to Texas in 25 days. She is of 3,300 tons gross and is propelled by two 700 i.h.p. submarine Diesel engines. A sister motor-vessel is also in service

B. & W. PATENTS BEFORE THE DANISH COURT

Considerable attention has recently been attracted in Denmark by the patent litigation brought against Burmeister & Wain of Copenhagen by Olaf E. Jorgensen of New York, who claims an interest in the profits of this company acquired through the use of improvements of his design adopted in Diesel-engine construction. Mr. Jorgensen was formerly with Burmeister & Wain and was sent by them to Scotland in connection with Diesel-engines built under B. & W. license; but now is consulting-engineer for the Worthington Pump & Machinery Corp. of New York, who are also engaged in the construction of Diesel-engines for marine purposes, their Diesel-engine being similar in many features in design to the B. & W. engine.

In the primary proceedings in the Copenhagen courts Mr. Jorgensen's attorney in an opening summary stated that Diesel patents were secured by Burmeister & Wain in 1898 and first brought into use by them in 1903. When this work was placed under the direction of Mr. Jorgensen and that only since that period has appreciable progress been made in the perfection of the Diesel-engine. Mr. Jorgensen was originally employed by Burmeister & Wain as a constructor and was later sent away on an investigation trip. On his return he devoted the entire knowledge and time to the improvement and perfection of the Diesel-engine, being, said the attorney, the first to boost the Diesel-engine industry in Denmark —the construction of which resulted in Burmeister & Wain's world-wide reputation.

Considerable thought was given to the question of reversing the four-cycle engine, which, according to the attorney, was solved in an admirable manner by the late Ivar Knudsen, Director of Burmeister & Wain, who obtained a patent for a reversing mechanism, as well as Mr. Jorgensen. In 1912 the Burmeister & Wain Oil Engine Co. was organized in Glasgow and Mr. Jorgensen was appointed Director. It will be remembered that this company was absorbed by Harland & Wolff, and on his retirement Mr. Jorgensen demanded an indemnity for his invention. But Burmeister & Wain claim that the patents are the property of the Company and not Jorgensen's.

Apparently the patent on which the claim is made is the B. & W. air starting system, which was taken out in Mr. Jorgensen's name.

According to one report, Mr. Jorgensen has received $1,000, but that the late Ivar Knudsen received $25,000. So he claims a royalty of 1 kroner per horsepower. As Burmeister & Wain have manufactured a total of 94,000 h.p., and their six chief licensees a total of 106,000 h.p., the royalties would amount to a large sum at current exchange rates. During the hearings the Judges attended a demonstration of two of the Diesel-engines now on order for a large motorship building for the Ocean Steamship Company. As we are going to press no decision has yet been reached by the courts.

Among the Motor Work-Boats

BATES & EDMONDS MARINE OIL-ENGINE

Shortly the new Bates & Edmonds Hvid-type oil-engine will be introduced to the marine market for work-boat installations.

WESTERN OIL-ENGINE INSTALLATION

A 100 b.h.p. Western marine oil-engine has been purchased by Herringer & Scott of Rio Vista, Calif.

FISHING-BOAT "MANDY BISHOP" TO HAVE OIL-ENGINE

Capt. Fred Bishop of Patchogue, is installing a 60 h.p. Fairbanks-Morse oil-engine in his 65′ fishing schooner, "Mandy Bishop."

ANOTHER WORTHINGTON-ENGINED VESSEL

The Bucyrus Company of South Milwaukee, Wis., are building a dredge in which a 300 b. h.p. Worthington airless-injection oil-engine is being installed.

NEW STANDARD OIL ENGINE

A marine type heavy-oil engine has been constructed by the Standard Gas Engine Co. of San Francisco, under Venn Severin license and will shortly be placed on the market.

ANOTHER DIESEL TRAWLER

The Independent Fish Co. of San Francisco, are having installed in their trawler "Lincoln" a 90 h.p. Atlas Imperial Diesel-engine. We predict increased profits for the "Lincoln."

STEERING TOWING-GEAR FOR TUG

The new electric-towing gear of the Carey-Davis Towing Co.'s tug "Dollie C" has been installed by Allan Cunningham & Co., of Seattle as well as an electric capstan. This is the first American-built electric towing engine, so its operation will be watched with interest by tug-boat owners.

NEW SOLID-INJECTION OIL-ENGINE AT STOCKHOLM

A new experimental airless-injection oil-engine of 60 h.p. has been running preliminary trials—the engine having been designed by Mr. Hesselman, who is responsible for the design of the well-known Polar Diesel-engine. At normal load a fuel-consumption of 175 grams per b.h.p. was reached with an absolute colorless exhaust.

FOUR NEW ENTERPRISE DIESEL INSTALLATIONS

The Los Angeles Shipbuilding & Dry Dock Company are installing in the schooner "Lily" two 75 h.p. Enterprise Diesel-engines. The schooner "Sequoia" is also having installed two 75 h.p. Enterprise Diesel-engines, by the Crowley Shipyards of Oakland, Calif.

Fred Christenson of Rio Vista, Calif., is installing in his boat a three-cylinder 90 h.p. Enterprise Diesel-engine, and the Rio Vista Lighterage Company of the same city is installing a four-cylinder 10½″ x 14″ Enterprise Diesel-engine of 165 h.p. in one of their boats.

OIL-ENGINED WORK-BOATS IN MEXICO

Recently a number of orders have been received from Mexican shipowners by the Venn Severin Machine Company of Chicago, builders of the Venn-Severin surface-ignition oil-engine. Among these orders is a 4-cylinder 2-cycle engine of 170 b.h.p. to be installed in the new 223-ton wooden ship "Eulalia," owned by A. Cerisola of Vera Cruz. We are giving an illustration of this vessel showing her under construction. When completed she will be placed in service between Vera Cruz and Galveston, Texas. The "Eulalia" is 140 ft. long, of 26 ft. breadth and 10 ft. depth.

The same owner has ordered a Venn-Severin oil-engine of 80 b.h.p. for the purpose of converting his existing vessel "Concha" from gasolene power to heavy-oil. The "Concha" is 70 ft. long, 24 ft. breadth and 6 ft. depth. We are also enabled to give an illustration of this little vessel.

The Venn-Severin oil-engine is now being built on the Pacific Coast by the Standard Gas Engine Co., of San Francisco, Cal.

The Mexican 95 tons motor-vessel "Coucha," now being converted from gasolene to Venn-Severin oil-engine power

OIL-ENGINE REPLACES GASOLENE ENGINE

The George B. Spearin Company of New York have just removed the gasolene engine from their boat "May" and have installed a Fairbanks-Morse 100 h.p. oil-engine. This is another instance proving that gasolene engines cannot be used in commercial work these days where they have to face competition from oil-engined work-boats.

MOTOR-WHALER TO USE WHALE-OIL FUEL

Recently a member of the staff of the Seattle office of Motorship inspected the motor-whaler "Herman," which vessel rescued Stefansson and also Amundson from the Arctic. This vessel has been recently equipped with a 250 shaft h.p. Atlas-Imperial Diesel-engine. It has been erected on the foundations of the previous Atlas distillate-engine. While our representative was aboard maneuvers were carried-out at the oil docks. When the engine was on tests in the Atlas shops it was run on whale-oil, upon which fuel she operated perfectly. Consequently, if Capt. Peterson of the whaler "Herman" runs short of fuel on his seven months' voyage to the Arctic he will be able to "catch" additional fuel.

WINTER SERVICE OF LIGHTER "AURORA"

One of the most severe tests of a small oil-engined work-boat is to put it in service on a long run in winter in ice-infested waters. The Bolinder-powered lighter "Aurora" which was fully described in our November, 1921 issue, page 902 has been in service all winter on a regular run between Nantucket and New York, driving thro' thin ice a great part of the time, but never being laid-up on account of any trouble whatsoever. No steam craft could have performed better.

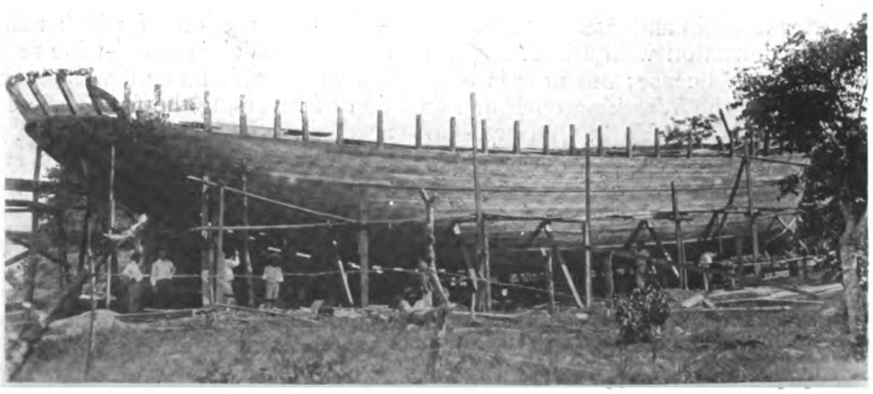
NEW PARTY FISHING-BOATS TO HAVE OIL-ENGINES

Considerable interest in oil-engines is being manifested by the fishermen at Sheepshead Bay, L. I., where fishing parties are very popular. Several new boats are being built for this season, among them being the "Rose R" for Capt. Dick Pearson, of Canarsie, this being of 65′ in which a 100 h.p. Fairbanks-Morse oil-engine is being installed. Another is for Capt. Fred Wrege, whose boat will be a fast 75′ V-bottom, building by Jacobson & Peterson, in which a 100 h.p. Fairbanks-Morse oil-engine is being installed.

CONVERTING FIRE-BOATS TO DIESEL POWER

Engineers of the City of Portland, Ore., are investigating the possibility of converting the city's two fire-boats, "George H. Williams" and "David Campbell," from steam to internal-combustion power, with the view to reducing the cost of operation and stand-by charges —thus eliminating the necessity of maintaining steam at all times. Both Diesel and gasolene engines are being considered.

Because of the number of hours that the fire-boats are in actual service, the engineers doubt if the lower fuel-consumption and the lower cost of fuel-oil will warrant the higher first-cost of Diesel-engines, and that it is possible gasolene-engines may prove satisfactory for the purpose. On the other hand, we suggest that the engineers take into consideration the question of "safety-first," as a vessel carrying a large quantity of gasolene will be a very dangerous proposition while fighting a fire. Elimination of this danger of fire and explosion, in our view, is more important than the question of economy, particularly with a fire-fighting craft.



The Mexican motor-vessel "Eulalia" under construction. She is of 223 tons d. w. and is being fitted with a Venn-Severin 170 b.h.p. oil-engine

The Pioneer American Diesel Passenger-Boat

Successful Record of Operation of the Nelseco-Engined "Suquamish"

"MOTORSHIP" has always endeavored to refrain from publishing guesses, probabilities, and what-may-occur stories. Our policy is to give publicity to what has actually been accomplished in the oil-engine field. One of the firms best qualified to talk about the use of the Diesel-engine in passenger-service is the Kitsap County Navigation Co., of Seattle, Washington, who put into operation in 1914 the first Diesel passenger-boat in America, the "Suquamish," of 75 gross and 55 net tons and 92 ft. long. We therefore feel that the opinion of these owners, based on eight seasons' operation of this boat, is worth consideration. Their verdict reads:

"Based on the results we have secured in this instance, and gauging our operating costs with those of other boats, we feel that the Diesel-engine has sufficiently proven its worth to lead us to put in more of the same power units as we find it necessary to expand our fleet."

What more could one ask? This conclusion was reached after the Diesel-boat had been in service right alongside a steam-boat similar to the "Suquamish" in every respect except power plant owned and operated by the same company. During eight seasons of service the cost of operating the steamer has been 25 per cent more than that of the Diesel-boat. Not only that, but the latter has been more popular with passengers because of the absence of smoke and dirt. Regular runs have been made out of Seattle to various points on Puget Sound during the Summer months, covering about 132 miles a day, or 24,000 miles in a season. In the neighborhood of 15,000 passengers have been carried.

The passenger motor-vessel "Suquamish," powered with a Nelseco Diesel engine and which has seen many years of successful operation

Her 180 h.p. Nelseco Diesel-engine was installed when the vessel was built in 1914 by Wilson Bros. from designs by Lee and Brinton. The only changes which have been made in this time have been changing from pump to gravity—feed on the oiling system, fitting a new type of oil-tight gasket in the lubricating-system and changing the tapered end of the crankshaft where the fly wheel is attached to the straight sided crankshaft after two had been broken. The change from pump to gravity feed was made in the interests of economy only.

It is the opinion of the owners based on their experience that the chief fault of the Diesel-engine is lack of accessibility. "We find," they say, "that repair work on the "Suquamish" is much more costly than on our other boats, not because the work in itself is more difficult and takes more time, but because the whole thing must be torn to pieces for even minor repairs. This means that we may have to hold the "Suquamish" off for a whole day to make a repair which in itself could be handled in far less time. When the manufacturers of Diesel engines get their handiwork down to the point where it will be easy to repair, they should easily get the business from the operators of small boats. The high air-pressure which we thought at first was required was another drawback to the general use of the engine, but we have since learned that we can make reductions there without impairing the efficiency of the engine in the least. When we first commenced operating the Diesel-engine in the "Suquamish" we generally maintained about 1,000 pounds air-pressure, but now we use only between 500 and 700 pounds with entirely satisfactory results. A motorship the size of the "Suquamish" is easily operated with a clutch, but it is a question as to whether this would be as successful when larger boats were considered."

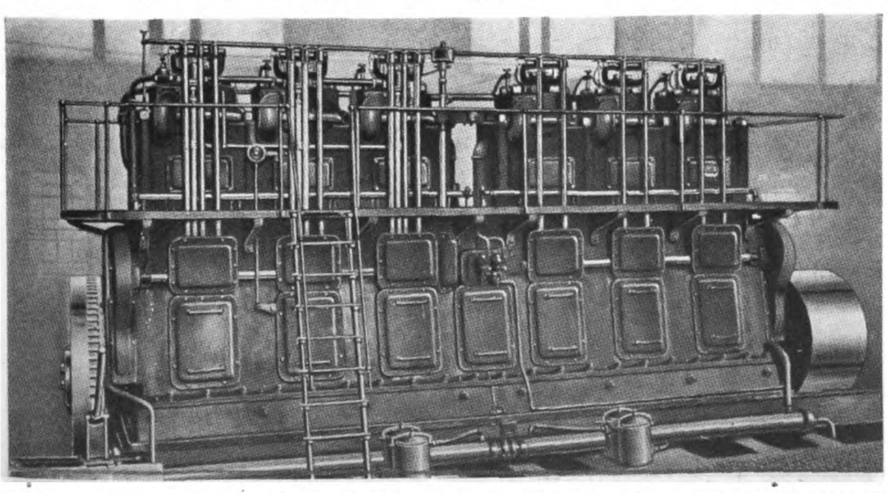
Since the engine in the "Suquamish" was installed some years ago and was one of the first marine Diesel-engines to be installed in this country quite naturally great improvement along the lines suggested has taken place. The absence of serious troubles with Diesel-engines built at present is gratifying; reversible Diesel-engines in horse power as low as fifty are now available, but for many engines the reverse gear is necessary. In spite of slight troubles which are inherent with any piece of machinery the Diesel-engine is still the most reliable and economical power plant for marine use. The fuel-cost of the "Suquamish" has only amounted to $1.76 per day of 12½ hours, or 1⅓ cents per mile.

Motorship would be glad to hear from any operator of a steam passenger-boat which can equal the record of the "Suquamish."

A NEW 500 B.H.P. BRONS MARINE OIL-ENGINE

In this country the equivalent to the well-known Dutch Brons oil-engine is the Hvid, licenses for which have been secured by such firms as the Dodge Sales & Engr. Co., Bates & Edmonds, and many other firms. But so far only comparatively small sizes have been constructed. In Holland, however, the parent company has constructed a 6-cylinder engine which has an output of 500 shaft h.p. at 200 R.P.M., so this design of motor is now likely to take its place in power plants especially suited for the propulsion of medium-sized vessels such as in tug-boats and coastwise craft. The makers of this engine are the Brons Motor Works (Brons Motorenfabrik) of Appingdam. The engine is not reversible and will operate in conjunction with a reversing-propeller. Its weight, including fly-wheel, pumps and the hydraulic mechanism for reversing the propeller, is 51 tons. The fuel-consumption is 0.415 lb. (0.185 kg) per brake horsepower hour.

In the engine an interesting device has been incorporated which is now used for all multi-cylinder engines of the Brons design. This device automatically equalizes the power output of the working cylinders, and is based on the principle that the exhaust-temperature rises with the load, and that any difference in the temperature corresponds with the difference in the load. A needle is inserted in the exhaust outletpipe of each cylinder-head, and it expands and contracts in accordance with the temperature of the exhaust-gases. The needle is connected to a small balance which actuates the needle-valve of the vaporiser by means of a bell-crank, the latter operating simultaneously on a horizontal rod along the cylinder-heads and transmitting the result and motion of the needles to the engine governor. Consequently, the power of the entire engine is governed in addition to the output of the various cylinders being balanced.



The new 6-cylinder 500 b.h.p. Brons marine oil-engine. There are a number of American firms manufacturing similar type engines under Hvid patents

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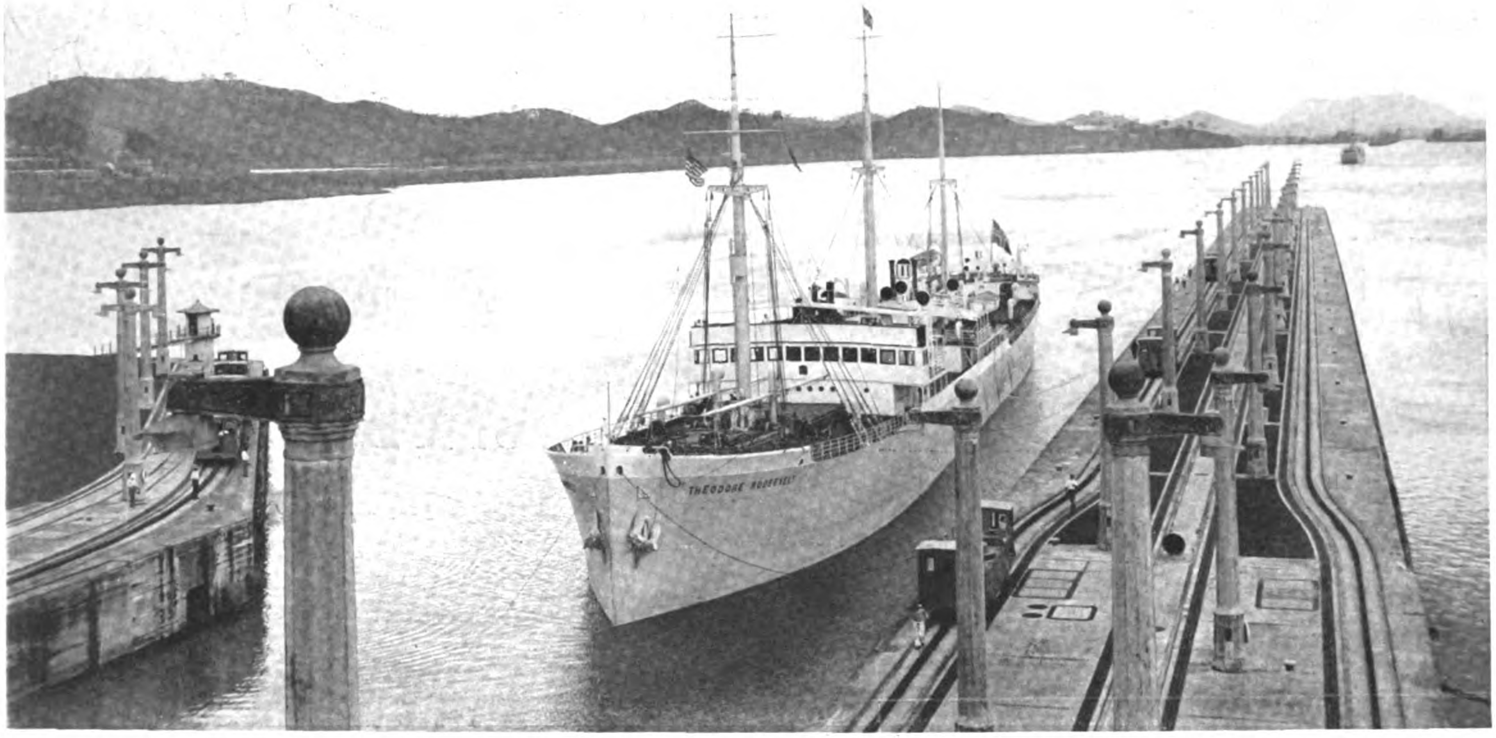
NEW FLOUNDER DRAGGER

Captain Robert Stinson of Newark, N. J., is just about to receive delivery of a new fishing-craft to be used in flounder dragging, in which a 45 h.p. Fairbanks-Morse oil-engine is being installed by the Hunter Machine Co. of Rockland, Maine. This boat was built by Wilbur Morse of Friendship, Maine, and is bound to prove an interesting craft.



A striking picture of Fred Olsen's 11,000 tons d. w. motorship "Theodore Roosevelt" in the Panama Canal. She is powered by twin 1,100 i.h.p. Burmeister & Wain Diesel-engines

MANY MOTORSHIPS USE PANAMA CANAL

THE increase in the number of motorships using the Panama Canal has been so remarkable that the Governor of the Canal Zone devoted a paragraph to that subject in his last annual report to the Secretary of War. He called attention to the fact that the number of motorships using the canal during the first six months of the fiscal year was 61, with an aggregate net tonnage of 125,909, and regardless of the general shipping depression during the second half of the year 74 motorships with an aggregate net tonnage of 202,298 passed through. The majority of them were under Danish, Swedish and Norwegian flags.

The ship shown in our illustration was named after the man who was the prime mover in the building of the Panama Canal and to whose management and inspiration the success of the project was largely due. Theodore Roosevelt made a trip to the Canal Zone during the construction days and his enthusiasm gave an impetus to the morale of the entire force that literally "made the dirt fly." Unfortunately he never saw the finished product of his dream and untiring efforts.

The motorship "Theodore Roosevelt" is shown entering the Pedro Miguel locks after the passage through Miraflores Lake *en route* from the Pacific to the Atlantic. The lines have already been made fast to the electric mules that tow the ships through the locks. The "Theodore Roosevelt" is owned by Fred Olsen & Co. of Kristiania, Norway, and was built and powered by Burmeister & Wain. She is 425 ft. 5 in. long, 55 ft. breadth and 38 ft. 6 in. depth, and of 11,000 tons deadweight. She has two 1,100 shaft h.p. six-cylinder Burmeister & Wain Diesel-engines.

LAUNCH OF MOTORSHIP "ARNUS"

A new Diesel-driven tanker named "Arnus" was launched by Swan, Hunter & Wigham, Richardson, Ltd., of Newcastle-on-Tyne, England, on March 14, to the order of the Cia. General de Tabacos de Filipinas of Spain, making the sixth motorship put into the water by this shipbuilding company. The "Arnus" is very similar in size to the tanker "Conde de Churruca," built last year by Sir Wm. Armstrong, Whitworth & Co. and propelled by Armstrong-Sulzer Diesel-engines. She is 6,100 tons d.w., 365 ft. length b.p. (377 ft. overall), by 49 ft. breadth and 28 ft. 9 in.

In the "Arnus" two Neptune two-cycle Diesel-engines are installed. These are of the long-stroke port-scavenging type, developing 1,000 shaft h.p. each from 6 cylinders, of 17 in. diameter by 30 in. stroke at 125 r.p.m.

At the launch Mr. J. W. Christie of the builders stated that the owners of the "Arnus" were in the unfortunate position of having ordered this vessel when prices were very high and freight very good, but they will benefit by having the foresight to order the vessel propelled by internal-combustion oil-engines, as she will be more economical in operation than a steam-driven ship.

Oil-fuel is carried in tanks at the sides of and under the engine-room and in a deep-tank forward, the total amount being over 500 tons. The engineers and greasers will be accommodated aft in deckhouses on the poop, the captain and officers will be in deckhouses amidships; whilst the crew is in the forecastle. The cargo winches will be operated by steam, but the steering-gear will be of the Hele-Shaw type. Preliminary details and drawings of the Neptune Diesel-engines of this vessel have been published in MOTORSHIP, and it will be remembered that the scavenging cylinders are placed under the working cylinders and are used for starting and reversing the main engines with low-pressure air. Forced lubrication is adopted. The main air-compressors are driven from the main engines, but all the engine-room auxiliaries are electrically driven. This vessel is built on the Isherwood system.

New Werkspoor Diesel-engined motorship "Hallfried" just prior to her launch at the Rijkee Yard, Rotterdam

THE SULZER TWO-CYCLE MARINE ENGINE

Paper Read Before the Institute of Marine Engineers, London, England, on Jan. 31, 1922.—By Engr.-Lieut. Commander L. J. Le Mesurier, R. N.

MOTORSHIP does not believe that the best interests of the industry are served by setting-up one particular make or type of Diesel-engine and comparing it directly with other makes or types, yet we do feel that complete technical descriptions of leading makes are valuable to our readers. Eliminating the controversial side, Lieut. Commander Le Mesurier's paper on the Sulzer Diesel-engine will be useful in giving an understanding of the practice of this firm. He is the chief-engineer of the Diesel Dept. of Sir W. Armstrong Whitworth & Co. who are Sulzer licensees.

Commander Le Mesurier describes the principles of operation of both two and four-cycle engines, stating that in a two-cycle engine having a given size of cylinder that the power developed should be twice that developed in a four-cycle engine of those dimensions, provided the piston-speed and mean-pressure remain the same. He states that this efficiency is not realized in the internal-combustion engine outside of the Diesel-type because it is impossible to obtain a high mean-pressure or to run at such high mean piston-speeds, with the result that full advantage cannot be taken of the saving in weight which would otherwise be possible in comparison with the four-cycle type. But in the Diesel-type, he says, it is possible to take full advantage of the inherent advantages.

Sulzers have become known so well for their two-cycle engines that perhaps the reader will be somewhat surprised to learn that the author of this paper states that Sulzers have manufactured a total of 450,000 H. P. in four-cycle Diesel-engines, as well as a large number of two-cycle engines, thereby gaining unique experience and being in a position to judge of the merits of each. He states that their decision is to build four-cycle engines of powers up to about 1,000 h.p. only. "The main defect of their large four-cycle engine has been the liability to heat-cracks in the cylinder-covers and expensive up-keep of exhaust-valves, as well as excessive weight, space required and more costly manufacture.

Commander Le Mesurier considers that the most important and distinctive feature of the Sulzer design is the method of scavenging and recharging the cylinder, the scavenging-air at 1.5 to 2 lbs. pressure being supplied by a reciprocating-pump or, in marine engines of over 1,000 H.P., by an electrically driven turbo scavenge-pump. The reciprocating or direct-driven pump absorbs about six per cent of the B.H.P., which power is saved in the case of the engine of over 1,000 h.p. Starting and maneuvring is improved by supplying slightly warmed scavenge-air in sufficient quantities to completely sweep-out the cold starting-air and thus commence compression with a temperature best suited to produce proper combustion.

Next in importance in this engine, Mr. Le Mesurier discusses the heat-stresses of the cylinder-cover, caused by the temperature of combustion. In the two and four-cycle engines, assuming the same weight of fuel burnt per firing stroke, the two-cycle engine will in a given time burn twice the amount of fuel and develop twice the amount of power, the maximum-temperature in the case of the two-cycle engines being slightly higher owing to a higher compression-temperature. The mean-temperature of the two-cycle type will be about 25 per cent higher than that of the four-cycle engine because in the latter the temperature is reduced by the lower average-temperature obtained during the exhaust and inlet-strokes. The design of cylinder-covers as required for two-cycle engines in order to cope with this high temperature is then taken-up and the Sulzer cover design evolved about six years ago with only one opening directly in the center of the cover is illustrated and described.

The mechanical-details connected with starting and reversing arrangements, ports, lubrication, bearings and stresses are fully discussed in an interesting manner. Weight and space-requirements of both types of installations of Diesel-engines are also mentioned. By advocating the independent rotary-blower Sulzers save in length of engine as against a direct-drive pump on the end of the engine.

MANY PACIFIC-WERKSPOOR DIESEL ORDERS

QUITE a number of orders have recently been received for Werkspoor-Diesel marine engines by the Pacific Diesel Engine Company of Oakland, Cal. In addition to four six-cylinder engines of 500 b.h.p. each for two Golden Gate ferries they are to receive another order for a third pair of the same size from the same company. The first ferry-boat is to be launched as we close for press and the keel for the second craft will be laid on the same berth immediately she takes the water. We are enabled to give an illustration of one of these engines, which as stated are to be installed in conjunction with electric drive.

In an early issue we propose to give additional illustration of this engine together with a detailed description. Although of the trunk-piston type this engine incorporates all the well-known features of the Pacific-Werkspoor crosshead design, such as in the twin 1,150 i.h.p. sets in the Standard Oil Co.'s tanker *H. T. Harper* and in the same company's twin-screw tanker *Charlie Watson*, which has two 650 i.h.p. engines. Furthermore, it is probable that two additional tankers to be laid down shortly will each have twin 300 b.h.p. Pacific-Werkspoor Diesels in conjunction with electric drive.

Captain Ridout's tug *Penguin* has had her gasolene motor removed and is now being fitted with a four-cylinder directly reversible Pacific-Werkspoor Diesel of 250 shaft h.p. with direct pilot-house control. Reversing by air is accomplished by starting on the two-cycle and then running on the four-cycle principle, as was successfully practiced in the Werkspoor-Diesel freighter *Sembilan*, built eleven years ago, and still in consistent and successful service. The *Penguin* will operate in San Francisco Bay.

Now being installed to the order of the Vail Company is a 250 shaft h.p. Pacific-Werkspoor Diesel in a cattle-boat operated by the Vaquero Line between Santa Rosa Island and San Pedro. This craft has had her gasolene engine removed.

The Carey-Davis Towboat Co., of Seattle, Wash., are putting a three-cylinder 150 shaft h.p. Pacific-Werkspoor Diesel-engine in their towboat *Dolly C.* This is the second of their fleet to have oil-engines, the first recently being fitted with a Fairbanks-Morse oil engine. Other boats will soon be converted as intimated in MOTORSHIP last year.

Finally a 200 shaft h.p. Pacific-Werkspoor Diesel is being installed in the passenger excursion boat *Galvez*, owned by Captain Dalehite and operating between Galveston and Houston, Texas. The Pacific Diesel Engine Co. report a number of other orders are now being negotiated, and that the near future looks very promising.

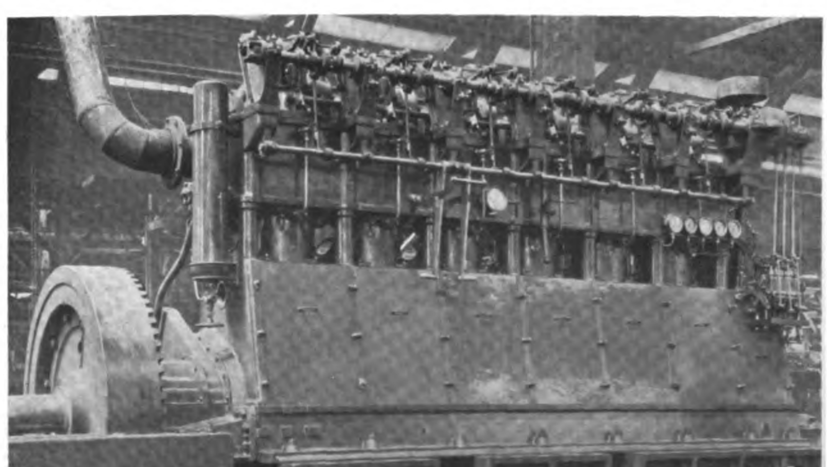
Now making demonstration runs in the company's plant at Oakland are two cross-head-type Pacific-Werkspoor marine Diesels of 850 shaft h.p. each, similar in design to the ten sets constructed for the United States Shipping Board.

MOTORSHIP PLANS OF THE ADMIRAL LINE

As yet no definite plans regarding the motorship program of the Admiral Line of San Francisco and Seattle, Mr. H. F. Alexander, Pres., have yet been issued. Apparently the Company has been negotiating with the Shipping Board for the purchase of 5 Late-type vessels of about 4,500 tons d.w.c. each, at a price of $8.00 per ton d.w. on the understanding that they are converted to Diesel power. Also they are said to have been considering the purchase of the steamers "Wallingford" and "Silvernado," built on the Pacific Coast, with a view to converting them to Diesel power. In addition the company has actually purchased the "Dawnlite," "Daylite," "Starlite" and "Moonlite," which are auxiliary schooners of about 3,000 tons, and which vessels are of 2,694 tons d.w.c. and are under powered with a 320 h.p. oil-engine. The company is considering taking the McIntosh & Seymour Diesel engines from some wooden motorships now on the Pacific Coast and installing them in the "Dawnlite" class boats. These boats for several years have been owned by the Standard Oil Co. of N. J., who purchased them when under construction at Toledo.

PROPOSED 8,700 TONS REFRIGERATOR MOTORSHIP FOR NEW YORK OWNERS

Plans have been drawn-up by E. A. Goodsell, a director of the Fruit Auction Co., 204 Franklin St., New York, for a Diesel-driven motorship of the combined refrigerator and passenger class of 8,700 tons, for service between New York and Chile. It is expected that bids will shortly be asked. Accommodation is to be provided for 120 passengers.



One of the Pacific-Werkspoor 500 shaft h.p. Diesel engines of the first of the three Golden Gate electric ferries

Interesting Notes and News from Everywhere

TO BUILD DIESEL ENGINES

Very shortly the Central Marine Engineering Works of Hartlepool, England, will take up the construction of Diesel engines.

CONVERSION OF VENICE CANAL CRAFT

A number of small steamers on the Grand Canal, Venice, Italy, have been converted to Ansaldo-San-Giorgio surface-ignition oil-engine power.

"KOBENHAVN" BREAKS TAIL-SHAFT

Recently the new Danish training auxiliary "Kobenhavn" put in at San Francisco with a broken tailshaft. The lowest tender for repair was $7,000.00.

STEERING-GEAR FOR GOLDEN GATE FERRIES

Electrical steering-gears, hand steering-gears and hand capstans for the two Golden Gate Diesel-electric driven ferries will be made and supplied by Allan-Cunningham & Co. of Seattle, Wash.

LORD DUNRAVEN BUILDING BIG YACHT

A twin-screw 1,000 shaft h.p. oil-engined yacht is now building for Lord Dunraven by Camper & Nicholson. The vessel is about 180 ft. long and will be propelled by two 500 b.h.p. Vickers-Petters surface-ignition engines.

DIESEL-ELECTRIC DREDGERS FOR U. S. WAR DEPARTMENT

It is reported that the number of Diesel-electric driven dredges to be built for the U. S. War Dept. will be four instead of one, as announced on page 201 of our March issue.

PROPOSED FLEET OF MOTOR FRUIT-CARRIERS

An offer to finance a fleet of fast Diesel-driven fruit-carriers for service between Trinidad and Great Britain is said to have been made by the British Shipping & Finance Corp. of London.

MOTORSHIPS "ASTMAHCO III" AND "ASTMAHCO IV"

The motorships of the above names formerly operated by the Astmahco Navigation Co., which is a subsidiary of the Astoria Mahogany Co., have been assigned to C. D. Mallory & Co. of New York, who will operate them.

PROPOSES BUILD SPERRY OIL ENGINE

Information has reached us to the effect that a well-known ship repair yard on the east coast is negotiating for the construction of the Sperry marine oil-engine. As the matter is indefinite we will refrain from publishing the name of the firm in question.

MAIDEN VOYAGE OF MOTORSHIP "PINZON"

After a successful maiden-voyage to Mediterranean ports, the Beardmore-built and engined fruit-carrying motorship "Pinzon" has returned to her home port. She exceeded the builders' expectations in regard to maneuvring, reliability and fuel-consumption and has created practically international interest.

TWO DIESEL TRAWLERS ORDERED

Atlas Diesel-engines are to be installed in the two 65 ft. trawlers for the Western California Fish Co., which are to be built at a total cost of $50,000. The two hulls together will cost $18,850 of this amount and will be built by Anderson & Siener of San Francisco, Calif. The first will be ready by July 15th.

THE WOODEN MOTORSHIP "SANTA FLAVIA"

A new packing company at Seattle, Wash., is converting the wooden motorship "Santa Flavia" into a salmon carrier. This vessel is fitted with twin 320 h.p. Bolinder oil-engines. The firm in question is the International Packing Company.

FOUR FAST REFRIGERATOR MOTORSHIPS PROJECTED

Four leading British shipbuilding companies have tendered for the construction of a fleet of four Diesel-driven combination passenger-and-meat carrying motorships to be operated between King Sound, North West Australia and the United Kingdom. The vessels will have a speed of 14 knots and will carry 200 passengers and 2,500 tons of chilled and frozen meat.

JAPAN AND GEAR-DRIVEN DIESEL MOTORSHIPS

News reaches us that Blohm and Voss of Hamburg, Germany, have delivered to a Japanese shipowning company, two motorships propelled by Augsburg submarine-type Diesel-engines through reduction-gears.

TRIALS OF MOTORSHIP "CANTON"

Recently the Swedish East Asiatic Co.'s new 10,560 tons d.w.c. motorship "Canton" ran trials, a speed of 12½ knots being attained. The vessel left on her maiden voyage to Hamburg, Singapore, Hongkong, Shanghai, Kobe & Yokohama.

OUR REGISTRY OF MOTORSHIP ENGINEERS

C. R. Davies, Diesel engineer experienced in installation of oil-engines, repairs and survey. Two years Chief-Engineer of British Motor-vessels "Inniscroon," "Resolute" "Stratum," "Omoiara." Assistant-Engineer Glen Line's motorship "Glengyle." Address 56 West 91st Street, N. Y. C.

J. W. Mulligan, 75 Tysen St., New Brighton, Staten Island, N. Y. Has license for chief-engineer, unlimited motorship tonnage five years. Apprenticeship machinist, chief-engineer "Mapleland," 1st Asst. M.S. "Worden." Has been guarantee-engineer for Fairbanks-Morse Co.

P. J. Butterly, 132 De Kalb Ave., Brooklyn, N. Y. Has had broad experience for 15 years with many types of oil-engines. Chief Eng. of m. s. "Santa Isabel," 1st. Asst. Eng. of m. s. "Amazon," 2nd. Asst. Eng. of m. s. "Santa Flavia," "Holden Evans," and has been with Diesel-oil engine testing department of Ingersoll-Rand Co.

Mr. W. G. McConnell, 2415 Ave. F., Galveston, Texas, has 500 tons engineer's license for a motorship and asst.-engineer's license for motorship, any tonnage. Was eleven months second-asst. engineer on motorship "Solarina" and third asst.-engineer on the "J. F. Penrose" for one trip. The "Penrose" has McIntosh & Seymour Diesel-engines, while the "Solarina" has Beardmore surface-ignition engines.

THE "CAMRANH" TO BE COMPLETED

Work has been resumed on the Sulzer Diesel-engined 11,700 tons motorship "Camranh" at the yard of the Ateliers et Chantiers de La Loire, Nantes, France, which work had been temporarily suspended, the workers having agreed to a reduction in wages.

GLEN LINE HAS TWELVE BIG MOTORSHIPS

With the placing in service of the new motorship "Glenbeg," and Glen Line of London will have a fleet of 12 Diesel motorships and 5 steamers. Four of these motor-vessels are of 12,500 to 14,000 tons d. w. and of 6,400 i.h.p. in twin-screws, namely the "Glenbeg," "Glengarry," "Glenogle," and "Glenapp."

NEW LARGE MOTOR FISHING-VESSEL

Now completing to the order of Bellows & Squires Co. of Ocrans, Va., is a new Menhaden type fishing-vessel which will shortly be ready for service. She has a carrying capacity of about 6,000 fish and is being equipped with a Fairbanks-Morse heavy-oil-engine of 300 shaft h.p. All auxiliary pumps and deck equipment are operated by electricity, auxiliary generating sets being provided in the engine-room for this purpose. The vessel is 144′ long over all, 21′ breadth and 12′ depth of hold, and will have a cruising radius of several thousand miles. She is the sixth vessel for this firm since the war equipped with oil-engines.

DAN COX AND MOTORSHIPS

Before the Joint Congressional Committee investigating the merchant-marine question Daniel H. Cox, the naval-architect and Shipping Board experts stated that the fleet was deficient in ships with Diesel & Diesel-electric drive, and it would cost $50. to $60. a d.w. ton to convert existing steamers.

THE FREIGHTER "MONARCH" DIESEL-POWERED

There is considerable freighting on the rivers of California and many of these cargo-boats are being powered with Diesel-engines. The latest is the "Monarch," owned by George Wright of Stockton, Cal., in which an Atlas Imperial Diesel-engine of 55 h.p. is being installed.

SMALL STEAMERS CONVERTED TO OIL-ENGINE POWER

Two years ago the Coburn Steamship Company of Greenville Junction, Maine, installed a 100 h.p. Fairbanks-Morse surface-ignition oil-engine in one of their steamers. The savings of this new installation over the former steam plant were so great that they are now installing a 150 h.p. Fairbanks-Morse engine in another steamer.

ANOTHER DISTILLATE-ENGINE REPLACED BY A DIESEL-ENGINE

The "Glencove," a 56 ft. by 16 ft. tow-boat owned by Heringer & Scott is having her distillate-engine removed and replaced by a 100 h.p. Western Diesel-engine at the yard of John Twigg & Sons, Oakland, Cal. This engine is the one which was recently exhibited in San Francisco, referred to on page 200 of our March issue.

DOXFORD'S ENGINE AND BOILER-OIL

In Mr. J. L. Chaloner's article in our March issue on pages 187 and 188, two or three typographical errors unfortunately crept in, which we take this occasion to correct. In the first column, on page 187, the fourth paragraph should read "In those early days the compressor," etc. In Appendix No. 1 on page 188 the Settling Point should read 8° F. and in Appendix 2 on the same page the revolutions should read 76.2 instead of the figure given.

DANISH SHIPOWNER ORDERS THREE MOTORSHIPS

Because of the success of his single-screw Burmeister & Wain Diesel-engined motorship "Leise Maersk," 4,450 tons d.w.c., A. P. Moller, owner of the Odense Shipyard and Managing-Director of the Svendborg Steamship Company, has ordered three additional Diesel-driven motorships. One will be a single-screw vessel 30′ longer than the "Leise Maersk," while the other two will be twin-screw vessels of 6,000 tons d.w. All three will have Burmeister & Wain Diesel engines and the hulls will be built at the Odense shipyard.

CHAIRMAN LASKER AND THE SUBSIDY

The following is an extract from a plea for a Ship Subsidy made before the U. S. Senate Committee on Commerce on April 4th by Albert D. Lasker, Chairman of the U. S. Shipping Board.

"After months of deliberation, in January last the board decided to undertake to sell its tonnage at world market prices, and on its steel freighters, after careful investigation, it found this to be a minimum of $30 per ton for the best tonnage. So depressed is the world's shipping at present, and especially so timid are operators under the American flag, that we have, even at these prices, been able to dispose of but 100,000 dead weight or 65,000 gross tons.

"Nor can we see any great hope of disposal of an appreciable part of the total tonnage we have, unless through Government aid.

"Vessels have been sold as low as $8 a dead weight ton when the purchasers promised to equip Lake types with Diesel engines.

"Section 11 of the present Jones Act provides that for a term of five years the Shipping Board may recover into a construction loan

Eugene Schneider, iron master; a leading figure of the International Chamber of Commerce and head of the great French engineering and industrial firm of Schneider et Cie. of Le Creusot, France, who in 1919 took a beautiful 72-Page Art Advertising-Supplement to "Motorship"

fund $25,000,000 annually, or a total of $125,000,000. Thus far the Shipping Board, like the horse that eats its head off, has used all the moneys for operation and construction that have come to it from liquidation, and there is nothing in the loan fund. The Board, however, hopes with proposed appropriations soon to be made available, to have its debts liquidated by no late date, and asks that it be permitted out of further liquidation, to accrue to the construction loan fund as expeditiously as possible the $125,000,000, and begs permission to loan this at rates as low as 2 per cent.

"We propose at most to loan two-thirds of the value of the ship; the balance must be furnished by the owner. The low interest rate will be given only for special types of ships that will be considered essential for the building of a balanced merchant marine for peace and war-time purposes, and will be measured with a view to equalize the capital costs."

COURSE AT THE UNIVERSITY OF CALIFORNIA

Announcement has been made by the College of Mechanics of The University of California of the appointment of Mr. Chas. F. Gross of Baltimore, Md. as Assistant Professor of Marine Engineering and Naval Architecture. Professor Gross is a member of the Society of Marine Engineers and Naval Architects and the Society of Naval Engineers. The appointee is a graduate of the Massachusetts Institute of Technology, after which he was an instructor in the department of Marine Engineering and Naval Construction at the United States Naval Academy, Annapolis, Maryland.

The courses in Marine Engineering and Naval Architecture at the University started in January, 1918, under the direction of Professor D. W. Dickie, the well known Naval Architect of the Pacific Coast. Formerly the courses were under the supervision of the United States Shipping Board which desired to train deck and engine men for the merchant marine. After the armistice the courses were changed to fit the regular curriculum of the University. The courses as stated in the bulletin cover the designing of ships as well as the propelling plant.

Records show that Colleges offering similar courses have at present the greatest number of students along the lines of Marine Engineering and Naval Architecture despite the fact that shipbuilding is at a low ebb. It bids fair to predict that the University of California will be the centre for technical training along these lines on the Pacific Coast.

DIESEL-ENGINES OWNED BY THE U. S. SHIPPING BOARD

Of the marine-type Diesel-engines built for the U. S. Shipping Board five have been sold, being two of 900 shaft h.p. and three of 750 shaft h.p. The engines completed and now on hand in storage, are as follows:

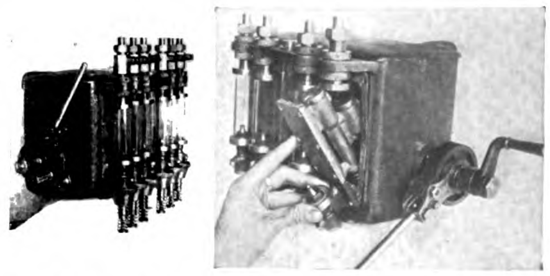
No. of Engines	Power	Type
5	750 shaft h. p.	McIntosh & Seymour Trunk-Piston.
16	900 shaft h. p.	McIntosh & Seymour Crosshead.
10	825 shaft h. p.	Pacific-Werkspoor Crosshead.
—		
Total 31		

All of these engines are of the four-cycle direct reversible type, and all were constructed in the United States.

A DANISH LUBRICATOR FOR OIL-ENGINES

Dealing from a world aspect the development of lubricators has not kept pace with the international progress of the oil-engine, and without question the most suitable and best mechanical-oilers for the lubrication of marine and stationary oil-engines have been produced in America, and these have seen extensive adoption in Europe. Consequently, it is very unusual to see the introduction of a foreign device of this type in the United States, and without question a European oiler will receive active competition from both business and manufacturing aspects.

Before us are details of a Danish lubricator which has features of design and construction worthy of more than passing comment. This is the Densil oiler, made by the Densil Motor Works and introduced into this country by Wm. Braat of New York City. A general idea of the design can be obtained by referring to illustrations. It will be noted that the amount of oil to the individual feed-lines can be regulated while the engine is in operation, and additional oil can be given by hand by pressing the knob of the adjusting-screw of the various individual pumps. A good feature is that the pressure-feed of oil is always visible through a glass sealing tube—the oil passing through water. Facilities have been made for cleaning so the suction and discharge valve can be taken out bodily for cleaning. It is merely necessary to remove one cover screw for each valve. Regardless of the temperature or viscosity of the oil, the



The Densil lubricator. Illustration on the right shows its accessibility

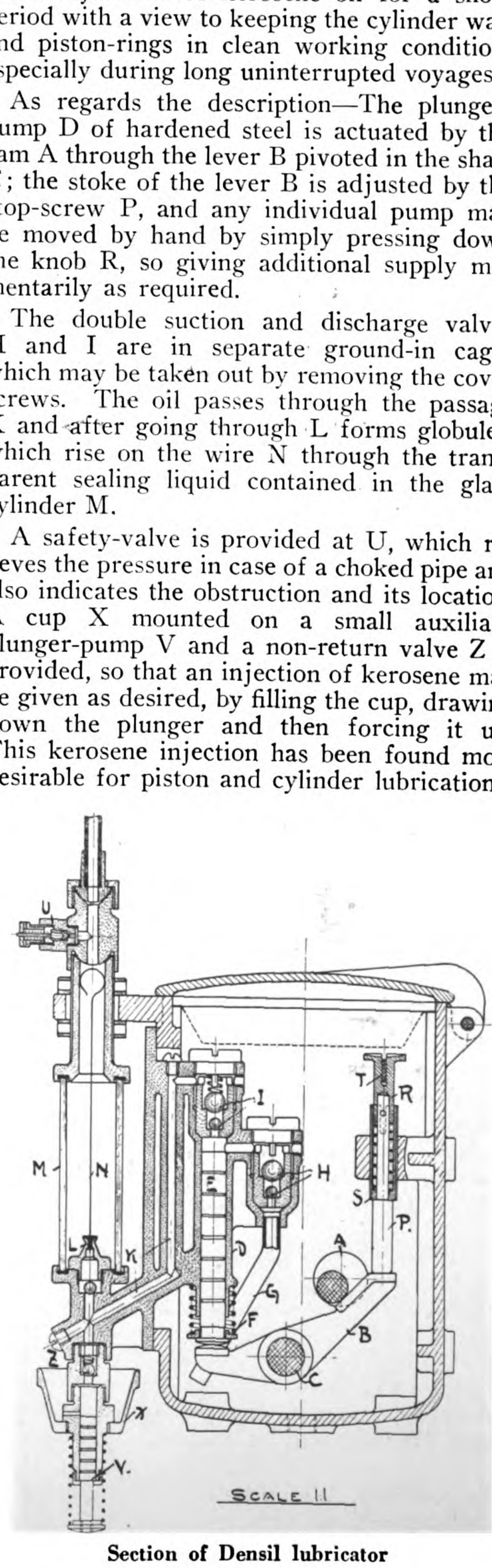
pressure feed is always constant, unless, of course, the oil is practically frozen solid. With further regard to accessibility, each individual pump, together with its sight feed in all parts may be taken from the body of the pump without disturbing the others.

An unusual feature is that some of these lubricators have been fitted with an extra hand-pump at the lower part of the discharging channel where the safety-valve is usually arranged. With this arrangement a piston and cylinder of the main engine can be given injections of kerosene oil for a short period with a view to keeping the cylinder wall and piston-rings in clean working condition, especially during long uninterrupted voyages.

As regards the description—The plunger-pump D of hardened steel is actuated by the cam A through the lever B pivoted in the shaft C; the stoke of the lever B is adjusted by the stop-screw P, and any individual pump may be moved by hand by simply pressing down the knob R, so giving additional supply momentarily as required.

The double suction and discharge valves H and I are in separate ground-in cages which may be taken out by removing the cover screws. The oil passes through the passage K and after going through L forms globules, which rise on the wire N through the transparent sealing liquid contained in the glass cylinder M.

A safety-valve is provided at U, which relieves the pressure in case of a choked pipe and also indicates the obstruction and its location. A cup X mounted on a small auxiliary plunger-pump V and a non-return valve Z is provided, so that an injection of kerosene may be given as desired, by filling the cup, drawing down the plunger and then forcing it up. This kerosene injection has been found most desirable for piston and cylinder lubrication.



Section of Densil lubricator